Interim Remedial Measure/Remedial Investigation Work Plan

430 West 207th Street
Inwood, New York
Block 2203 Lots 9

April 16, 2021

Prepared for:

410 West 207th Acquisition, LLC
111 Eighth Avenue
New York, New York 10011

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

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Table of Contents

Table of Contents (Continued)

Tables

Figures

Table of Contents (Continued)

Appendices

Certification

I, Noelle Clarke, certify that I am currently a NYS registered professional engineer and that this Interim Remedial Measure/Remedial Investigation Work Plan for the 430 West 207th Street Site was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Noelle Clarke, P.E.		
NYS Professional Engineer #072491	Date	Signature

1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux) has prepared this Interim Remedial Measure/Remedial Investigation Work Plan (IRM/RIWP) on behalf of Inwood Lot 9 Associates LLC (Applicant) to detail the scope of work to conduct demolition of the existing supermarket building/asphalt parking lot, a remedial investigation (RI), and the localized remedial excavation of contaminated soil at 430 W 207th Street, Inwood, New York (Site). The Site is approximately 60,000-square feet (sq ft) and is identified as Block 2203, Lot 9 on the New York City Tax Map. A Site Location Map is included as Figure 1.

The Applicant is submitting this IRM/RIWP concurrently with a New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) application for the Site. The property is currently leased by the Applicant and is an active grocery store. As part of this IRM/RWP, the existing structures and asphalt parking lot at the Site will be demolished to facilitate the investigation of the impacts to soil, groundwater, and soil vapor and begin the removal of documented soil contamination. This will facilitate the selection and implementation of the final remedy. At this time, the Applicant anticipates that the redevelopment plan is to provide affordable and market rate multifamily housing, ground level retail/commercial space and parking. A foundation pile/pile cap will be installed in the remediated area.

This IRM/RIWP has been prepared in accordance with NYSDEC procedures set forth in the document titled DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010 (DER-10), and complies with all applicable Federal, State, and local laws, regulations and requirements. The IRM/RI is a component of, but does not constitute, the overall remedy for the Site. The objectives of the IRM/RI are to remove existing structures to allow for a thorough and complete investigation of the Site and source area excavation of contaminated soil. This will advance the BCP goals but will not constitute the entire remedy for the Site.

The remainder of this IRM/RIWP is organized as follows:

Section 2: Site Background

Section 3: Objectives, Scope of Work, and Rationale

Section 4: Elements of the Interim Remedial Measure

Section 5: Soils/Materials Management Plan

Section 6: Reporting

Section 7: IRM/RI Implementation Schedule

2. Site Background

Relevant Site background information is presented in this section. A Site Location Map is included as Figure 1.

2.1 Site Description and Setting

Site Location	
Site Name:	430 West 207th Street
Site Address:	430 West 207th Street
Site Town, County, State:	Manhattan, New York County New York
Site Tax Identification:	Block 2203, Lot 9
Site Topographic Quadrangle:	Central Park, New York
Nearest Intersection:	W 207th Street and 9th Avenue
Area Description:	The Site is bounded by West 207th Street and the 207th Street Train Yard Facility and a gasoline station across the street to the north, West 206th Street and residential apartment buildings to the south, a parking lot and 9th Avenue, beyond which is a commercial use building and the Harlem River, to the east, and residential and commercial use buildings to the west.

Site Information	
Site Acreage:	1.38
Site Shape:	Rectangular
Site Use:	Grocery store with rooftop parking and a partial basement and an asphalt-paved parking lot
Number and Size of Buildings (Year Built):	One one-story building approximately 34,000 square feet (1969)
Basement/ Slab-on-Grade:	The west side of the one-story building onsite includes a partial basement, the east side of the building is slab-on-grade.

2.1.1 Site History and Operations

Based on a review of previous environmental reports and documentation, including historic Sanborn Fire Insurance Maps, the Site was undeveloped until 1926. From 1926 through 1969, the eastern portion of the Site was occupied by the Miramar Bath House (a three-story commercial structure) and an adjoining large swimming pool on the northern portion of the parcel. By 1969, all structures mentioned above were demolished and construction for the grocery store and paved parking lot areas were completed and remain present today.

2.1.2 Utilities

Based on observations made during the previous Site investigations, several utilities are present at the Site. For future construction at the Site, it is assumed that Consolidated Edison will continue to provide electric and natural gas service to the Site, and potable (drinking) water and sewer service will continue to be supplied to the Site by the City of New York.

2.1.3 Topography

A review of the United States Geological Survey (USGS) Central Park, New York 7.5-minute series topographic quadrangle map and Site-specific survey indicated that the topography of the Site and surrounding area slopes to the southeast toward the Harlem River. The elevation of the Site ranges from approximately 20 to 13 feet above mean sea level from the northwest to southeast portions of the Site, respectively.

2.1.4 Wetland Areas and Surface Water Bodies

Based on a review of the previous environmental reports, the Site is not located in, or adjacent to, regulated wetlands, however, the Site is within the 500-year flood zone. The nearest natural surface water body is the Harlem River, located approximately 580 feet to the east.

2.1.5 Soil and Underlying Formation

Based on the previous environmental reports and investigations completed by Roux and other consultants, the Site is underlain by fill (consisting of sand, gravel, brick, concrete, slag, tile, and glass) to depths ranging from 3 to 11 feet below land surface (ft bls). Fill materials overlie native fine to coarse sand with some gravel and silt. Brown to dark grey organic-rich silt and clay lenses were observed at several locations. Bedrock was encountered between 20 and 80 ft bls during the geotechnical investigation performed in conjunction with Roux's 2018 subsurface investigation.

2.1.6 Hydrogeology

Groundwater was encountered between 9 and 12 ft bls. Under natural, undisturbed conditions, shallow groundwater flow generally follows the topography of the land surface. Based on the surrounding topography, the presumed groundwater flow in the vicinity of the Site is in an east-southeasterly direction towards the Harlem River, located approximately 580 feet to the east of the Site. Groundwater flow direction is likely influenced by subsurface utilities, lithology, and other subsurface features.

2.2 Summary of Environmental Conditions

The following is a summary of environmental conditions at the Site.

2.2.1 Previous Environmental Sampling

The following previous environmental investigations that have been conducted at the Site:

- **Phase I Environmental Site Assessment (ESA)**, prepared by EBI Consulting (EBI), dated October 7, 2010
- **Phase II ESA,** prepared by Stantec, dated December 8, 2011
- **Subsurface Investigation Report (SIR),** prepared by Roux Environmental Engineering and Geology, D.P.C. (Roux), dated December 19, 2018

- **Remedial Investigation Report (RIR),** prepared by Roux, dated June 12, 2019
- **New York State Department of Environmental Conservation (NYSDEC) Brownfields Cleanup Program (BCP) Eligibility Soil Sampling for 430 West 207th Street, New York, New York,** performed by Roux Environmental Engineering and Geology, D.P.C, January/February 2021

A summary of the findings from assessments of the Site is provided below. The reports are provided in Appendix A.

Phase I ESA, prepared by EBI, dated October 7, 2010

Several recognized environmental conditions (RECs) were identified in the EBI Phase I ESA. The ESA encompassed both Lot 9 and Lot 21 within Tax Block 2203, but for the purposes of this application, only Lot 9 is discussed below. The RECs are summarized as follows:

RECs

- The potential presence of fill material is a REC for Lot 9. Urban sites such as the Site have typically been filled with material imported from off-site sources during development. Such fill material may have unknown origins and has the potential to exhibit contaminant concentrations above regulatory cleanup criteria.
- Two freight elevators with below-grade hydraulic cylinders service the grocery store at the Site. The elevators are reportedly maintained by a local maintenance company. Inspection of the elevator mechanical rooms did not reveal staining or other evidence of a release of hydraulic fluid; however, based on the hydraulic cylinders being located below grade and the potential presence of polychlorinated biphenyls (PCBs) in the hydraulic fluid, the presence of the two elevators is considered a REC.

Phase II ESA, prepared by Stantec, dated December 8, 2011

Stantec performed a Phase II ESA in December 2011.The ESA encompassed both Lot 9 and the adjacent Lot 21 within Tax Block 2203, but for the purposes of this application, only Lot 9 is discussed below. A summary of findings is provided below:

Soil/Fill

According to the Stantec Phase II ESA, PID readings in soil samples collected at the Site were consistently measured at levels between 0.3 and 1.1 ppmv. Volatile organic compound (VOC), semivolatile organic compound (SVOC), and metals exceedances of Unrestricted Use Soil Cleanup Objectives (UUSCOs) within the boundaries of the Site are depicted on Figure 2.

Groundwater

According to the Stantec Phase II ESA, VOCs, SVOCs, and metals analyzed in groundwater did not exceed NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs). Groundwater sample locations within the boundaries of the Site are depicted on Figure 3.

Elevator Inspections

In August 2011, Stantec met with an elevator vendor to inspect the two elevators located in the Site building. The elevator located on the western side of the building is an 8’x8’ freight elevator at the rear of the building near the loading dock. When the elevator was raised and secured to reveal the pit, the pit had approximately four inches of water accumulated above the concrete floor. There was a 5-gallon bucket set in the pit, which purpose Stantec reported was apparently to capture leaking hydraulic fluid. The origins of the observed water could not be established and the water had a sheen. A sample of this water was collected in a one liter amber glass container and during transit (approximately 2-3 hours), a distinct layer of oil separated from the water

within the glass bottle. Stantec instructed the laboratory to analyze the oil matrix layer for PCBs by EPA Method 8082. No PCBs were detected above laboratory reporting limits in this oil matrix sample.

Remedial Investigation Report, prepared by Roux, dated June 12, 2019

Roux performed an investigation of soil, groundwater, and soil vapor at the Site in June 2019, which is described in the RIR prepared for the New York City Mayor's Office of Environmental Remediation (NYCOER). The RIR encompassed both Lot 9 and Lot 21 within Tax Block 2203, but for the purposes of this application, only Lot 9 is discussed below. A summary of findings is provided below:

Soil/Fill

According to the RIR for the Site, the following analytes in soil exceeded NYSDEC Part 375 Restricted Residential Soil Cleanup Objectives (RRSCOs):

Metals

- Barium, cadmium, copper, lead, and zinc.

Exceedances of RRSCOs and UUSCOs within the boundaries of the Site are depicted on Figure 2.

Groundwater

According to the RIR for the Site, the following analytes in groundwater exceeded NYSDEC AWQSGVs:

VOCs

- Benzene, chloroform, ethylbenzene, m+p xylene, o-xylene, toluene, and styrene

SVOCs

- Acenaphthene, naphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and phenol

Metals (total)

- Lead, antimony, iron, magnesium, manganese, and sodium

Exceedances of AWQSGVs within the boundaries of the Site are depicted on Figure 3.

Soil Vapor

Soil vapor samples collected showed moderate levels of petroleum related VOCs and low levels of CVOCs. According to the RIR for the Site, the following analytes were detected in soil vapor samples that were collected as part of the December 2018 SIR:

VOCs

- 1,2,4-trimethylbenzene, 1,3-butadiene, 2-butanone, n-hexane, p-isopropyltoluene, acetone, benzene, bromodichloromethane, butane, carbon disulfide, carbon tetrachloride, chloroform, chlorobenzene, chlorodifluoromethane, chloromethane, cyclohexane, dichlorodifluoromethane, ethylbenzene, isopropylbenzene, methyl methacrylate, methylene chloride, total xylenes, isooctane, styrene, tetrachloroethene (PCE), toluene, trichloroethene (TCE), and trichlorofluoromethane

Detections of analytes in soil vapor within the boundaries of the Site are depicted on Figure 4. As a note, Category B data packages are available for this data and will be used during preparation of a RIR, including a Data Usability Summary Report (DUSR), for the Site.

NYSDEC BCP Eligibility Soil Sampling, performed by Roux, January/February 2021

Roux performed a subsurface soil investigation in January/February 2021. Fifteen soil borings (RX-15 through RX-25, RX-30 through RX-33) were advanced during the investigation of the Site. Similar to previous investigations, groundwater was encountered between 9 and 12 feet below land surface (ft bls). Subsurface materials generally contained fill materials (consisting of sand, gravel, brick, concrete, slag, tile, and glass), to depths ranging from 3 to 11 feet ft bls. Fill materials overlie native fine to coarse sand with some gravel and silt. Brown to dark grey organic-rich silt and clay lenses were observed at several locations (RX-16, RX-17, RX-21, RX-23, RX-24, and RX-30).

A total of 29 soil samples including associated quality assurance/quality control (QA/QC) samples were collected in laboratory-supplied containers and submitted for analysis of VOCs, SVOCs, metals, pesticides, and PCBs. A summary of findings of detected compounds and comparison to NYSDEC Part 375 RRSCOs for soil is provided below:

Soil Results

The following metals and SVOCs are the primary contaminants of concern and exceeded the NYSDEC Part 375 RRSCOs:

SVOCs:

- Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene

Metals:

- Barium, cadmium, and lead

Exceedances of the RRSCOs and UUSCOs within the boundaries of the proposed Site are graphically depicted on Figure 2. As a note, Category B data packages are available for this data and will be used during preparation of a RIR, including a DUSR, for the Site.

2.2.2 Summary of Subsurface Conditions

Based upon the investigation, the primary contaminants of concern for the Site found in the subsurface include benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, polycyclic aromatic hydrocarbons (PAHs), and metals in soil and groundwater, and VOCs in soil vapor. A geophysical survey of the Site was completed, including ground penetrating radar and electromagnetic detection, and no evidence of the former underground storage tanks (USTs) or vaults were located by the study.

All data collected as part of the previous investigations completed by Roux is provided in Tables 1 through 11, Figures 2 through 4, and the sample locations are also shown on Figure 5. Note that the data collected as part of the previous investigations completed by Roux that are provided in Tables 1 through 11 has not been validated but will be validated as part of the RIR.

A summary of the results is provided below:

Soil

Soil was analyzed for VOCs, SVOCs, pesticides, PCBs, and metals and laboratory results were compared to the NYSDEC Unrestricted Use SCOs (UUSCOs), and NYSDEC Restricted Residential SCOs (RRSCOs). The investigations revealed elevated concentrations of polycyclic aromatic hydrocarbons (PAHs), and metals in soil. . More information on soil exceedances is provided below:

- VOCs including acetone (maximum 1.6 mg/kg), benzene (0.23 mg/kg), and total xylenes (0.75 mg/kg) were detected above their UUSCOs.
- Several SVOCs, consisting of PAHs including benzo(a)anthracene (maximum 11 mg/kg), benzo(a)pyrene (maximum 13 mg/kg), benzo(b)fluoranthene (maximum 15 mg/kg), benzo(k)fluoranthene (5.3 mg/kg), chrysene (maximum 10 mg/kg), dibenz(a,h)anthracene (2 mg/kg), and indeno(1,2,3-c,d)pyrene (maximum 8.4 mg/kg), were detected above their respective RRSCOs predominantly in intervals of fill on Site at depths ranging between 0.5 to 7 ft bls.
- Metals including arsenic (13.1 mg/kg), barium (maximum 967 mg/kg), cadmium (maximum 94.1 mg/kg), chromium (maximum 52.3 mg/kg), copper (maximum 520 mg/kg), lead (maximum 1,790 mg/kg), mercury (maximum 0.5 mg/kg), nickel (maximum 164 mg/kg), silver (39.5 mg/kg) and zinc (maximum 19,200 mg/kg) were detected above their UUSCOs. Of these metals, barium, cadmium, copper, lead, and zinc were also present at concentrations above their RRSCOs.
- Total PCBs were detected above their UUSCOs with a maximum concentration of 0.37 mg/kg.
- Pesticides, specifically 4,4'-DDE (max 0.041 mg/kg) and 4.4'-DDT (max 0.014 mg/kg) were detected above their UUSCOs.

Overall, the soil chemistry is consistent with data identified at sites with fill material in NYC.

Groundwater

Groundwater samples were analyzed for the same suite of analysis as described above in the soil results section. The majority of compounds analyzed were detected below the NYSDEC AWQSGVs with the exception of some VOCs, SVOCs, and metals. The following compounds were detected in exceedance of the AWQSGVs:

- VOCs including benzene (20 micrograms per liter [µg/L]), chloroform (7.3 µg/L), ethylbenzene (6 µg/L), m+p-xylene (36 µg/L), o-xylene (29 µg/L), styrene (14 µg/L), and toluene (23 µg/L) were detected above their AWQSGVs.
- SVOCs including acenaphthene (21 µg/L), benzo[a]anthracene (6.7 µg/L), benzo[a]pyrene (6.2 µg/L), benzo[b]fluoranthene (8 µg/L), benzo[k]fluoranthene (3.1 µg/L), chrysene (6.3 µg/L), indeno[1,2,3-cd]pyrene (3.7 µg/L), naphthalene (570 µg/L), and phenol (maximum 2.3 µg/L) were detected above their AWQSGVs.
- Total metals including antimony (3.8 µg/L), iron (max. of 12,600), lead (67.2 µg/L), magnesium (maximum 137,000 µg/L), manganese (max. of 826 µg/L), and sodium (maximum 1,400,000) were detected above their AWQSGVs. Most of these metals are considered to be naturally occurring and are not believed to be indicative of groundwater contamination present at the Site.

Soil Vapor

Two soil vapor samples were collected across the Site. Several petroleum-related VOCs, including BTEX (benzene, toluene, ethylbenzene, and xylenes), were detected in soil vapor samples throughout the Site during the Roux 2018 RI/Phase II ESA, however, there are no standards or guidance values for these compounds set by NYSDEC or New York State Department of Health (NYSDOH). Low levels of chlorinated VOCs (CVOCs) were also detected in the soil vapor samples. The NYSDOH October 2006 (updated in 2017) Guidance for Evaluating Soil Vapor Intrusion (NYSDOH Guidance) provides three matrices with guidance values for sub-slab and indoor air comparison for eight CVOCs. The concentrations of the CVOC detections were relatively low in soil vapor samples across the Site were below mitigate action levels.

<u>Matrix A Compounds</u>: carbon tetrachloride, cis-1,2-dichloroethene, 1,1-dichloroethene, TCE

- Carbon tetrachloride was detected at V-4 at a concentration of 0.84 µg/m^3.
- TCE was detected at V-4 at a concentration of 1.2 µg/m^3.

- Cis-1,2-dichloroethene and 1,1- Dichloroethene were not detected in soil vapor.

Matrix B Compounds: PCE, 1,1,1-trichloroethane, methylene chloride:

- PCE was detected in both soil vapor samples, at a concentration of 47 µg/m^3 at V-2 and at 0.75 µg/m^3 (estimated) V-4.
- 1,1,1-Trichloroethane was not detected in soil vapor.
- Methylene chloride was detected at V-4 at a concentration of 2.6 µg/m^3 (estimated).

Matrix C Compound: vinyl chloride:

- Vinyl chloride was not detected in soil vapor.

Based on the findings of the prior investigations, the following preliminary Areas of Concern (AOCs) that are to be further investigated and/or remediated as part of this IRM/RIWP:

- Presence of contaminated soil;
- Potential migration of contaminants of concern onto the Site in groundwater and soil vapor from surrounding properties.

3. Remedial Investigation Objectives, Scope of Work, and Rationale

Roux, on behalf of the Applicant, has developed the below RI scope of work that is intended to satisfy NYSDEC BCP requirements. Data collected during the RI, along with data collected during previous investigations, will determine the basis for future remedial actions for the Site. In the previous environmental investigations, Roux collected soil, groundwater and soil vapor data throughout the Site in a manner consistent with DER-10. In order to incorporate the prior data into the RIR, a DUSR will be prepared to validate that all data meets applicable data quality objectives. The 2011 Stantec Phase II ESA data was used at a preliminary screening level to select the locations of the eligibility investigation samples and proposed RI samples; however, since NYSDEC ASP Category B reports were not published in the 2011 Stantec Phase II ESA, this data will not be included in the DUSR submitted as part of the RIR/RAWP prepared for the Site.

Standards, Criteria, and Guidance (SCGs) for soil at BCP Sites are the numerical SCOs presented in 6 NYCRR Part 375. The SCOs are categorized into unrestricted use criteria and restricted use (residential, restricted-residential, commercial, or industrial) criteria, as well as criteria for protection of groundwater (PGW) and ecological resources. The applicability of each category of SCOs is determined based upon the current and reasonably anticipated future use of the Site, as well as cleanup tracks being evaluated. The anticipated redevelopment for the Site is affordable and market rate multifamily housing with ground level retail/commercial spaces and parking. Further discussion of cleanup tracks will be provided in the Remedial Action Work Plan (RAWP) to be submitted once the RI is complete.

Although the groundwater beneath the Site is not used as a drinking water source, based upon the evaluation of the current groundwater data discussed herein, the NYSDEC AWQSGVs – TOGS 1.1.1. will be considered.

Soil vapor data will be evaluated in accordance with the NYSDOH guidance.

3.1 Objectives

Based on the existing data for the Site and AOCs identified above, the following objectives have been identified for the RI portion of this IRM/RIWP:

- Further delineate the nature and extent of potential impacts to soil;
- Further delineate the nature and extent of impacts to groundwater within the Site and the potential for migration onto or off the Site;
- Further evaluate the nature and extent of soil vapor quality within the Site and the potential for migration onto or off the Site; and
- Collect sufficient data to perform a qualitative human health exposure assessment (QHHEA) for on-Site and off-Site receptors.

The RI will evaluate soil, groundwater, and soil vapor impacts on-Site and at the Site property boundaries to provide the basis for remedial action selection and to determine the general potential for off-Site impacts. Environmental data collected during the RI will be used to qualitatively assess the potential exposure of receptors to Site contaminants and develop the information necessary to support the development of a RAWP.

3.2 RI Scope

To accomplish the objectives stated above, the scope of work for the RI will include the following:

- The advancement of soil borings, installation of groundwater monitoring wells, and installation of temporary soil vapor points;
- The collection of soil, groundwater, and soil vapor samples sufficient to define the nature and extent of impacted media and current Site conditions;
- The collection of groundwater level measurements and land survey data as needed for developing a groundwater elevation contour map; and
- The performance of a QHHEA to identify existing and potential exposure pathways and evaluate contaminant fate and transport.

All investigation activity will be conducted in accordance with the applicable requirements of the NYSDEC DER-10. During the RI, Roux will conduct air monitoring in accordance with a Site-specific Community Air Monitoring Plan (CAMP), which has been prepared for the Site and is provided as Appendix B.

Quality Assurance/Quality Control (QA/QC) protocols will be followed to ensure that suitable and verifiable data results from sampling and analysis are obtained. To accomplish this, a Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) has been prepared and is provided as Appendix C.

A site-specific Health and Safety Plan (HASP) has been prepared for the Site and is provided in Appendix D.

All data will be produced in accordance with NYSDEC Analytical Services Protocol (ASP) Category B deliverables and will be reviewed and validated by Joshua Cope of Roux Associates, Inc., a party independent of the project team, in a DUSR before being incorporated into the RIR for the Site. All data will be submitted to NYSDEC in electronic format, in accordance with DER-10, Section 1.15.

The overall scope of each component of the RI is discussed in the following subsections. Detailed field sampling procedures are provided in the QAPP/FSP (Appendix C). The proposed sampling locations are shown on Figure 5 of this IRM/RIWP and additional information, including intervals to be sampled and sample rationale, is provided below.

3.2.1 Site Reconnaissance

Roux has performed a preliminary Site reconnaissance and has identified potential AOCs, described in Sections 2.2.2, which will be targeted during the RI. An inspection of the existing Site conditions will be conducted to determine final locations of soil borings and monitoring wells based on actual field conditions.

3.2.2 Soil Investigation

To further characterize the soil conditions and to delineate known contamination at the Site, a total of 15 soil borings will be completed once the current Site operator has vacated the building. The proposed sample locations are shown in Figure 5 and discussed below. Downgradient samples will be used for the purpose of assisting with the QHHEA.

Boreholes will be pre-cleared to five ft bls using non-intrusive methods, such as hand tools and/or vacuum excavation, prior to advancement of soil borings to verify the absence of utilities and/or other subsurface features (i.e. obstructions). Should a utility or other feature be observed during pre-clearance activities, the sampling location will be relocated as close as possible to the original location. Soil samples will be collected

by hand or by utilizing a GeoProbe® Direct-Push Drill Rig. Soil will be collected continuously from land surface to the bottom of the boring. During installation of the soil borings, the lithology will be recorded in accordance with the Unified Soils Classification System (USCS), and soil will be inspected for evidence (visual or olfactory) of contamination, including staining and/or odors, and field screened continuously for VOCs using a photoionization detector (PID) containing a 10.6 eV lamp.

Analysis of soil samples will occur in a phased approach. Initially, the shallowest soil sample collected from each borehole will be analyzed for the parameters listed below, with the deeper samples placed on hold at the laboratory. If the result of that analysis for each borehole contains exceedances of UUSCOs, the next sample depth will be analyzed to provide additional vertical delineation, and the deepest sample will be analyzed following this strategy as necessary.

Fifteen soil borings will be advanced to characterize soil conditions in the following locations at the Site:

Location	Sample Depth Intervals (in ft bls unless otherwise noted)	Rationale
SB-09-01	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-30; sample SB-09-01 is co-located with monitoring well MW-09-01.
SB-09-02	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-19; sample SB-09-02 is co-located with monitoring well MW-09-02.
SB-09-03	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-23; sample SB-09-03 is co-located with monitoring well MW-09-03.
SB-09-04	0-2, Hold 4-6 (depths are feet below basement slab)	To additional soil and soil vapor coverage within the existing basement; sample SB-09-04 is co-located with soil vapor sample SV-09-04.
SB-09-05	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-33; sample SB-09-05 is co-located with soil vapor sample SV-09-05.
SB-09-06	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-18; sample SB-09-06 is co-located with soil vapor sample SV-09-06.
SB-09-07	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-12; sample SB-09-07 is co-located with soil vapor sample SV-09-07.
SB-09-08	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-20; sample SB-09-08 is co-located with soil vapor sample SV-09-08.
SB-09-09	0-2, Hold 4-6 (depths are feet below basement slab)	To evaluate conditions in an area of the Site not previously investigated.
SB-09-10	4-6, Hold 6-8 (depths are feet below basement slab)	To provide additional data for the southwest corner of the Site.
SB-09-11	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near MR-7.
SB-09-12	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-32.

Location	Sample Depth Intervals (in ft bls unless otherwise noted)	Rationale
SB-09-13	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-25.
SB-09-14	12-14; Hold 14-16 and 16-18	To evaluate conditions in an area of the Site not previously investigated.
SB-09-15	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near MR-14.

Following sample collection, boreholes that will not be converted to monitoring wells or soil vapor sample points will be backfilled with soil cuttings with an upper bentonite plug and restored with like materials to surrounding grade to the extent possible to minimize drummed waste. Obviously contaminated soil cuttings will be placed into sealed and labeled NYS Department of Transportation (DOT) approved 55-gallon drums, pending characterization and off-Site disposal at a permitted facility. All soil borings will be surveyed by a licensed New York State surveyor to obtain horizontal and vertical coordinates.

3.2.3 Groundwater Investigation

Three permanent groundwater monitoring wells (MW-09-01 through MW-09-03) will be installed at co-located soil boring locations as discussed in the embedded table in Section 3.2.1. The proposed groundwater monitoring well locations are shown on Figure 5. The locations of the on-Site monitoring wells were chosen to extend general Site coverage based on the locations of previous groundwater sample locations. Additional monitoring well design details are provided in the QAPP/FSP in Appendix C.

Following installation, each proposed permanent monitoring well will be developed to ensure proper hydraulic connection with the aquifer and to reduce/eliminate turbidity of the groundwater. All monitoring wells will be surveyed by a licensed New York State surveyor to obtain horizontal and vertical coordinates. The depth to groundwater in each monitoring well will be measured using an electronic water/oil level meter and a groundwater contour map will be developed using the survey data utilizing data from permanent monitoring wells.

Following well development, each monitoring well will be purged consistent with USEPA low-flow sampling requirements and one round of groundwater samples will be collected no sooner than one week following their installation in accordance with the QAPP/FSP. Field parameters (e.g., pH, dissolved oxygen, oxidation-reduction potential [ORP], etc.) will be collected using a water quality meter during purging and prior to sampling. Additional details on sampling procedure are provided in the QAPP/FSP in Appendix C.

3.2.4 Soil Vapor Investigation

Five soil vapor samples will be collected during the RI. Soil vapor points SV-09-04 through SV-09-08 will be installed at co-located soil boring locations as discussed in the embedded table in Section 3.2.1.

The soil vapor samples will be collected from temporary soil vapor points installed by hand. Soil vapor sample SV-09-04 will be installed below the basement slab and samples SV-09-05 through SV-09-08 will be installed approximately two feet above the water table. New Teflon®-lined polyethylene tubing will be attached to a 6-inch stainless steel sample screen. The soil vapor points will be backfilled with #2 Morie sand to

approximately one foot above the screen. The remainder of the borehole will be backfilled with a concrete/bentonite slurry to grade.

The soil vapor samples will be collected using pre-cleaned (batch-certified) 6-liter summa canisters with regulators calibrated to collect samples over an eight-hour period. A helium tracer gas test will be performed on each vapor point to ensure the integrity of the vapor point seal prior to sampling in accordance with the procedures outlined in the NYSDOH Guidance. The proposed soil vapor sampling locations are shown on Figure 5. Additional details regarding soil vapor sampling methods are provided in the QAPP/FSP in Appendix C.

3.2.5 Laboratory Analysis

Soil and groundwater samples collected from the soil investigation described in detail below will be analyzed for the full Target Compound List (TCL) VOCs and SVOCs + 30 (10 VOCs and 20 SVOCs) highest concentration tentatively identified compounds (TICs), Target Analyte List (TAL) metals (including hexavalent chromium and total cyanide), TCL pesticides, TCL herbicides, TCL PCBs; TCL + 30/TAL, and the emerging contaminants (ECs) 1,4-Dioxane and Per- and Polyfluoroalkyl Substances (PFAS). PFAS include the 21 compounds listed in accordance with the Sampling, Analysis, and Assessment of PFAS under NYSDEC's Part 375 Remedial Programs guidance document dated January 2021 (NYSDEC January 2021 PFAS Guidance). To delineate and characterize groundwater quality beneath the Site, groundwater samples will be analyzed for total and dissolved TAL metals and SVOCs.

All soil vapor air samples will be analyzed using USEPA Method TO-15 for VOCs. All samples will be analyzed at a NYSDOH Environmental Laboratory Approval Program-certified (ELAP) laboratory. Additional details regarding laboratory analyses are included in the QAPP/FSP (Appendix C). All analytical data for the RI will be received with standard 5-day turn-around-time.

All RI data will be produced in accordance with NYSDEC ASP Category B deliverables and will be reviewed and validated by Joshua Cope, who is independent of the project team and who will prepare a DUSR before being incorporated into the final RIR for the Site. All data will be submitted to NYSDEC in electronic format, in accordance with DER-10, Section 1.15.

3.2.6 Qualitative Human Health Exposure Assessment

A QHHEA (on-Site and off-Site) will be performed following the collection of all RI data. The EA will be performed in accordance with Section 3.3(c)4 of DER-10 and the NYSDOH guidance for performing a qualitative EA (DER-10; Appendix 3B). The results of the QHHEA will be provided in the RIR.

According to Section 3.10 of DER-10, and the Fish and Wildlife Resources Impact Analysis Decision Key in DER-10 Appendix 3C, a Fish and Wildlife exposure assessment will be performed (if needed) based on the results of the RI results.

3.2.7 Surveying Assessment

All newly installed monitoring wells, soil borings, and soil vapor points will be surveyed by a New York Licensed Surveyor to obtain horizontal and vertical coordinates and grade elevations. Measuring point elevations from newly installed monitoring wells will also be surveyed to enable groundwater flow contouring. Horizontal coordinates will be based upon New York State Plane Coordinate System, Long Island Zone, North American Datum of 1983 (NAD 83) in US Survey Feet. Vertical elevations will be measured for top-

of-casing (measuring point) and grade elevations referenced to North American Vertical Datum of 1988 (NAVD 88).

3.3 Investigation Derived Waste Disposal

All wastes generated during IRM/RI will be handled, transported and disposed of in a manner consistent with Federal, State and local laws and regulations.

4. Elements of the Interim Remedial Measure

4.1 Scope of Work

The scope of work for the IRM consists of the following tasks:

- Establish Site security measures (fencing);
- Demolition of above-grade building, including asbestos containing material and lead-based paint abatement, as necessary;
- Demolition of building slab and below grade foundation elements;
- Demolition/removal of asphalt parking lot and surface features including light poles, signs, and fencing; and
- Localized remedial excavation and disposal of soil with contaminant concentrations known to be in excess of the UUSCOs and RRSCOs. Installation of a foundation pile and pile cap will occur in this remedial area (Figure 6).

The following sections provide additional details concerning the completion of the IRM objectives.

4.2 Mobilization and Site Preparation

The NYSDEC will be provided with at least five days advanced notice prior to intrusive activities. The selected Contractor will supply appropriately trained labor and materials required for the implementation of the IRM scope of work. In addition, necessary permits, insurance, bonds, and licenses required to complete the work will be obtained and fees necessary to obtain these permits will be paid. For the RI scope of work, this will include mobilization of equipment to the work area. Once demolition commences, the mobilization and Site preparation activities include:

1. Mobilization of equipment to the work area;
2. Installation of construction fencing (in accordance with New York City Department of Buildings [NYCDOB] requirements) and traffic barricades surrounding the Site to delineate the work zone, act as a work Site security measure, and mark the truck loading and decontamination areas;
3. Implementation of erosion and sediment control measures in accordance with the New York Guidelines for Urban Erosion and Sediment Control, if required. Hay bales will be placed surrounding the excavation areas to control stormwater runoff and surface water from entering or exiting the excavation, as necessary. Catch basin inlets will be protected to prevent demolition debris or disturbed soil from entering;
4. Set-up of staging areas for excavated soil, as necessary; and
5. Set-up of temporary facilities including decontamination pad in order to decontaminate trucks and other vehicles/equipment, as necessary.

4.3 Building Demolition

Building demolition will include asbestos abatement and the removal of lead-based paint as necessary, followed by dismantling and off-Site removal of above grade structures and foundation elements and slabs, including the basement. It will also include the removal of the asphalt pavement and all surface features at the Site, which includes lighting, signage, and chain-link fencing. Demolition will occur to facilitate completion of the RI, characterization of soil for disposal, and completion of the future remedy.

Once soil is disturbed as part of the subgrade feature removal for the building demolition, Roux will provide oversight of any limited soil disturbance activities and conduct air monitoring in accordance with the Site-specific CAMP. Oversight and CAMP will continue until the former building areas are stabilized and the exposed soil surfaces are covered with a temporarily cover consisting of four inches of stone or other NYSDEC-approved material. Details of the CAMP requirements are provided in Section 5.12.

4.4 Localized Remedial Excavation

Localized remedial excavation will be performed in an approximately 900 square foot area of known contamination where installation of a foundation pile cap will occur within the limits shown in Figure 6. The volume of excavation is estimated to be approximately 500 CY. Soil will be managed in accordance with Section 5. Roux will provide oversight of excavation activities and conduct air monitoring in accordance with the Site-specific CAMP. One endpoint sample will be collected to confirm Track 1 UUSCOs are achieved. Oversight and CAMP will continue until the localized pile cap work is complete and the exposed soil surfaces are covered with a temporarily cover consisting of four inches of stone or other NYSDEC-approved material. Details of the CAMP requirements are provided in Section 5.12. Handling and disposal of the soil will be performed in accordance with the Soil/Materials Management Plan provided as Section 5.

4.5 Underground Storage Tank Removal

There are no known USTs at the Site. Based upon the scope of work, it is unlikely that USTs will be encountered during the IRM. If unknown USTs are encountered, they will be decommissioned and removed by a Fire Department of the City of New York (FDNY) licensed installer/remover. Upon completion of any potential UST removal, the area will be inspected for the presence of contamination in soil and groundwater. Excavation of impacted materials may advance to the extent possible without causing an unstable condition and disposed of off-Site in accordance with all applicable regulations at a permitted disposal facility. Endpoint sampling will be completed in accordance with Sections 5.5 of DER-10 prior to backfilling in accordance with Section 5.9 herein. Following removal of any potential USTs, any potential USTs will be registered and closed in the NYSDEC Petroleum Bulk Storage (PBS) database (if over 1,100 gallons) and FDNY affidavits of closure will be obtained by a licensed UST installer/remover.

4.6 IRM Oversight

The implementation of the IRM will be overseen by a field engineer, geologist, or scientist under the supervision of the Remediation Engineer (RE) as described in this Work Plan. The RE is responsible for documenting that the contractor performs the work as specified in this Work Plan and provides the proper documentation required by NYSDEC. These documents will be submitted to the NYSDEC in the Final Engineering Report (FER); which is described in Section 6.0.

5. Soils/Materials Management Plan

The following sections provide the Soil/Materials Management Plan (SoMP) to be implemented during the IRM/RIWP.

5.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed during the IRM/RI activities under the supervision of Roux personnel.

5.2 Stockpile Methods

Soil excavated during Site redevelopment will be stockpiled on and covered with polyethylene sheeting or placed in roll-off containers until properly disposed, as necessary. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected at a minimum each week, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. Excavated soils will be stockpiled on, at minimum, double layers of 6-mil minimum poly-sheeting, will be kept covered at all times (except when material is being added or removed) with appropriately anchored polyethylene sheeting, and will be routinely inspected. Broken or ripped sheeting will be promptly replaced. If used, roll-off containers for saturated materials will be lined.

Stockpile activities will be compliant with applicable laws and regulations. Stockpiles of excavated soils and other materials will be located a minimum of 20 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles as needed, except for areas where access by equipment is required. Hay bales will be used as needed near catch basins, surface waters, and other discharge points.

5.3 Characterization of Excavated Materials

If hotspots, gross contamination, or structures to be remediated (USTs, vaults and associated piping, etc.) are encountered, they will be removed and endpoint remedial performance sampling completed before excavations related to Site development commence proximal to the hotspot or structure. Soil/ fill or other excavated media that will be transported off-Site for disposal will be sampled in accordance with the Site-specific QAPP/FSP that is provided as Appendix C, and in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this Work Plan.

5.4 Materials Excavation and Load-Out

Roux will oversee all invasive work and the remedial excavation and load-out of all excavated material.

The Applicant and its contractors are solely responsible for safe execution of all invasive and other work performed under this Work Plan. The selected contractor will be required to place a One-Call Dig Safe notification prior to mobilization. Existing private markout information, where available, will be consulted prior to excavation. Localized remedial excavation necessary for installation of the pile cap of the new building will have appropriate support of excavation (SOE) and will be permitted by NYCDOB.

The presence of easements on the Site has been investigated. It has been determined that no risk or impediment to the planned work under this IRM/RIWP is posed by easements on the Site. The presence of

utilities within/adjacent to the proposed work area will be investigated prior to the work in order to determine if there are any impediments to the proposed scope of work. NYSDEC will be notified of any changes required to the scope of work based on the geophysical survey.

Loaded vehicles leaving the Site will be appropriately securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements). If grossly contaminated material is encountered, loaded vehicles will be lined and tarped, as appropriate.

Loaded outbound trucks will be inspected by Roux and cleaned by the Site contractor before leaving the Site.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site sediment tracking. Vehicles/trucks will either be staged on asphalt/concrete, where still existing, or in the event that the asphalt/concrete is removed, a stabilized construction entrance will be constructed at any vehicle egress points. Regardless, all egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during the implementation of the IRM. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Mechanical processing of fill, asphalt, concrete and contaminated soil on-Site is prohibited.

5.5 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

The proposed inbound truck route to the Site is:

- Take the Major Deegan Expressway (I-87) to exit 9 to West Fordham Road/University Heights Bridge. Turn onto West Fordham Road and cross the University Heights Bridge. Continue onto West 207th Street and entrance to the Site will be on the left.

The proposed outbound truck route from the Site is:

- Turn right out of the Site and go southeast on West 207th Street. Cross the University Heights Bridge and continue onto West Fordham Road. Merge onto I-87 ramp.

These are the most appropriate routes and take into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, trucks loaded with Site materials will travel to/from the Site using these approved truck routes. West 207th Street and West Fordham Road are New York City Department of Transportation approved Local Truck Routes.

Trucks will avoid stopping and idling in the neighborhood outside the project Site, to the extent practicable. Queuing of trucks will be performed on-Site, when possible, in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during the IRM implementation.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. If loads contain wet material capable of producing free liquid, truck liners will be used.

5.6 Materials Disposal Off-Site

All soil/fill/solid waste excavated and removed from the Site will be disposed of in accordance with regulatory requirements based on the levels of contamination found to be present in waste characterization samples collected. Uncontaminated concrete and asphalt pavement may be disposed of as construction and demolition debris at a registered New York State Construction and Demolition Debris Processing Facility.

The following documentation will be obtained and reported for each disposal location used in this project to demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a letter or facility-specific waste profile/application from Roux or the Applicant to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter/profile/application will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the Roux or the Applicant. The letter will include as an attachment a summary of all chemical data for the material being transported (including Site characterization data); and (2) a letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material. These documents will be included in the FER.

The FER will include an accounting of the destination of all material removed from the Site during this IRM summarized in text and tabulated. A Bill of Lading system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils and will also be reported in the FER.

Any potential hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable local, State, and Federal regulations.

Appropriately licensed haulers will be used for material removed from this Site and will be in compliance with all applicable local, State and Federal regulations.

Waste characterization will be performed for off-Site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

5.7 Materials Reuse On-Site

Material removed for installation of the foundation pile cap may be reused to backfill the excavation if sampled in accordance with DER-10 and it is confirmed it meets UUSCOs. Any material with concentrations in excess of the UUSCOs will be disposed of offsite either under this IRM or as part of the Site-wide remediation to be described in a future RAWP.

Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing of the Site is prohibited for reuse on-Site.

5.8 Fluids Management

All liquids to be removed from the Site will be handled, transported and disposed in accordance with applicable laws and regulations. If any USTs are encountered, all liquids observed in the USTs will be

removed prior to closure. All liquids removed from the USTs will be sampled in a manner required by the receiving facility and in compliance with applicable laws and regulations. Liquid waste manifests will be reported to NYSDEC in the FER.

Dewatering is not expected to be necessary during the IRM activities.

5.9 Backfill from Off-Site Sources

All materials proposed for import onto the Site will be approved by Roux and will be in compliance with provisions in this IRM/RIWP prior to receipt at the Site.

Material from industrial sites, spill sites, or other potentially contaminated sites will not be imported to the Site. Solid waste will not be imported onto the Site. Material from other environmental sites may be imported with prior approval from NYSDEC (i.e., through the NYCOER Clean Soil Bank or through a Beneficial Use Determination).

All imported soils will meet NYSDEC-approved backfill or cover soil quality objectives for this Site. These NYSDEC approved backfill or cover soil quality objectives are the lower of the Protection of Groundwater or the protection of public health soil cleanup objectives for unrestricted use as set forth in Table 375-6.8(b) of 6 NYCRR Part 375. Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC. Nothing in the approved IRM or its approval by NYSDEC should be construed as an approval for this purpose.

Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Nothing in this IRM should be construed as an approval for this purpose.

In accordance with DER-10, the following material may be imported, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the final site cover, provided that it contains less than 10% by weight material which would pass through a size 80 sieve and consists of:

- gravel, rock or stone, consisting of virgin material from a NYSDEC permitted mine or quarry; or
- recycled concrete or brick from a NYSDEC registered construction and demolition debris processing facility if the material conforms to the requirements of Section 304 of the New York State Department of Transportation *Standard Specifications Construction and Materials Volume 1* (2002).

5.10 Stormwater Pollution Prevention

Applicable laws and regulations pertaining to stormwater pollution prevention will be addressed during the IRM activities. Erosion and sediment control measures (silt fences and/or barriers, and/or hay bale checks) will be installed, as appropriate, around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs to erosion and sediment controls shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

5.11 Contingency Plan

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during implementation of the IRM.

If USTs or other previously unidentified contaminant sources are found during on-Site remedial excavation, sampling will be performed on potentially contaminated source material and surrounding soils and reported to NYSDEC. Chemical analytical work will be for the full suite of parameters (TAL/TCL + 30 and Emerging Contaminants). Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will be also included in daily and monthly reports.

5.12 Community Air Monitoring Plan

CAMP monitoring will be implemented during all ground intrusive activities (i.e., during the RI Scope of Work and once the concrete slab or asphalt pavement are disturbed). The CAMP monitoring will be performed in accordance with the site-specific CAMP (Appendix B) and will include the real-time monitoring of VOCs and particulates at the upwind and downwind perimeter of the Site. Should monitoring results exceed action levels as noted in the CAMP, efforts will be made to mitigate/eliminate the exceedance and NYSDEC/NYSDOH will be notified.

5.13 Odor, Dust, and Nuisance Control Plan

5.13.1 Odor Control Plan

In addition to the CAMP monitoring, Roux will closely monitor the presence of any odors emanating from the work area.

Odor controls will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of odor suppressants to cover exposed odorous soils. If nuisance odors develop and cannot otherwise be controlled, additional means to eliminate them will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, the source of odors will be identified and corrected. If necessary, to identify or correct a nuisance odor source, work will be temporarily halted and will not resume until such nuisance odors have been identified and abated. NYSDEC will be notified of all odor complaint events.

5.13.2 Dust Control Plan

Dust management during invasive on-Site work will include, at a minimum:

- Use of properly anchored tarps to cover stockpiles;
- Exercising extra care during dry and high-wind periods; and
- Dust suppression will be achieved through the use of water for wetting excavation areas. Water will be available on-Site at suitable supply and pressure for use in dust control.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted, and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. NYSDEC will be notified of all dust complaint events.

5.13.3 Other Nuisances

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards. Rodent control will be provided during building demolition and during the remedial program, as necessary, to prevent nuisances.

6. Reporting

6.1 Reporting During Site Activities

Daily reports to NYSDEC and NYSDOH containing photo-documentation will be submitted during the days when intrusive IRM/RI activities take place as indicated in the Work Plan (daily reports will not be provided during demolition). Any change in reporting frequency will be pre-approved by NYSDEC. Daily reports will include a summary of all work completed that day; locations of work and quantities of material imported and exported from the Site; a summary of any and all complaints with relevant details (names, phone numbers); a summary of CAMP readings and an explanation of notable Site conditions; etc.

Monthly reports will be submitted to the NYSDEC on the 10th day of the following month. Monthly reports will provide an update of progress made during the reporting period, a summary of the daily reports, any analytical data received during the reporting period, any public participation activities, and a summary of activities scheduled for the next reporting period.

6.2 Final Engineering Report

Detailed information regarding the IRM (e.g., general description of the construction activities, waste disposal documentation, photos, etc.) will be included in the FER for the overall Site remediation once completed. FER will be certified by the Remedial Engineer, who is a Professional Engineer licensed in the State of New York, that the work was performed in accordance with the approved IRM/RIWP and any approved changes.

7. IRM/RI Implementation Schedule

This IRM/RIWP is anticipated to begin in August 2021 and will be completed by April 2022. It is anticipated that the actual on-Site duration of major remedial construction tasks will be completed as described below. It is anticipated that there will be a gap between the demolition and the remedial excavation phases of the project which was taken into consideration of the timeline below.

Timeframe	Description
April 2021	Submit BCP Application and IRM/RIWP to NYSDEC
August 2021	Begin demolition under the IRM and conduct RI Field Work
October 2021	Submit combined Remedial Investigation Report (RIR)/Remedial Action Work Plan (RAWP) to NYSDEC
February 2022	Complete demolition
March/April 2022	Localized remedial excavation under the IRM
March/April 2022	Finalize and certify RIR/RAWP, NYSDEC prepares Decision Document and Approval and issues Fact Sheet approving Remediation
April 2022	Commence Remedial Construction Under the RIR/RAWP
December 2022	Targeted Certificate of Completion

TABLES

Notes Utilized Throughout Tables	
Soil Tables	
J -	Estimated value
U -	Indicates that the compound was analyzed for but not detected
B -	The analyte was found in an associated blank as well as in the sample
P -	The RPD between the results for the two columns exceeds the method-specified criteria
RPD -	Relative Percent Difference
T -	Indicates that a quality control parameter has exceeded laboratory limits
ft bls -	Feet below land surface
DUP -	Duplicate sample
NA -	Compound was not analyzed for by laboratory
mg/kg -	Milligrams per kilogram
NYSDEC -	New York State Department of Environmental Conservation
UUSCO -	NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCO -	NYSDEC Part 375 Restricted Residential Soil Cleanup Objectives
--	No SCO available
Bold data indicates that parameter was detected above the NYSDEC Part 375 UUSCO	
Shaded data indicates that parameter was detected above the NYSDEC Part 375 RRSCO	
Groundwater Tables	
J -	Estimated Value
U -	Compound was analyzed for but not detected
T -	Indicates that a quality control parameter has exceeded laboratory limits
DUP -	Duplicate
NA -	Compound was not analyzed for by laboratory
NYSDEC -	New York State Department of Environmental Conservation
AWQSGVs -	Ambient Water-Quality Standards and Guidance Values
--	No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs	
Soil Vapor	
J -	Estimated value
U -	Indicates that the compound was analyzed for but not detected
ug/m3 -	Micrograms per cubic meter
Bold data indicates that parameter was detected	

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	MR-4	MR-4	MR-7	MR-12	MR-12	MR-14	MR-14
				Sample Date:	7/24/2018	7/24/2018	8/2/2018	7/24/2018	7/24/2018	7/30/2018	7/30/2018
				Sample Depth (ft bls):	1 - 1.5	9.5 - 11	0.5 - 2.5	1.25 - 3	3 - 4	1 - 1.5	5 - 6
1,1,1-Trichloroethane	0.68	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,1,2,2-Tetrachloroethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,1,2-Trichloroethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,1-Dichloroethane	0.27	26	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,1-Dichloroethene	0.33	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,2,3-Trichlorobenzene	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,2,4-Trichlorobenzene	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,2,4-Trimethylbenzene	3.6	52	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.013	0.011	0.0011 U	0.0011 U
1,2-Dibromoethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,2-Dichlorobenzene	1.1	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,2-Dichloroethane	0.02	3.1	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,2-Dichloropropane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,3,5-Trimethylbenzene	8.4	52	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.00050 J	0.0037	0.0011 U	0.0011 U
1,3-Dichlorobenzene	2.4	49	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,4-Dichlorobenzene	1.8	13	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
1,4-Dioxane	0.1	13	mg/kg		0.023 U	0.026 U	0.022 U	0.021 U	0.02 U	0.021 U	0.022 U
2-Butanone (MEK)	0.12	100	mg/kg		0.0056 U	0.0040 J	0.0055 U	0.0040 J	0.0032 J	0.0026 J	0.0015 J
2-Hexanone	--	--	mg/kg		0.0056 UT	0.0019 JT	0.0055 U	0.0053 UT	0.0051 UT	0.0053 U	0.0054 U
4-Methyl-2-pentanone (MIBK)	--	--	mg/kg		0.0056 UT	0.0064 UT	0.0055 U	0.0053 UT	0.0051 UT	0.0053 U	0.0054 U
Acetone	0.05	100	mg/kg		0.0067	**1.6**	0.0055 U	0.022	0.016	0.0069	0.0046 J
Benzene	0.06	4.8	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.00089 J	0.0011	0.0011 U	0.0011 U
Bromochloromethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Bromodichloromethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Bromoform	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Bromomethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Carbon disulfide	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.00075 J	0.0011 U	0.0011 U
Carbon tetrachloride	0.76	2.4	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Chlorobenzene	1.1	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Chloroethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Chloroform	0.37	49	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Chloromethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 UT	0.0011 U	0.001 U	0.0011 U	0.0011 U
cis-1,2-Dichloroethene	0.25	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
cis-1,3-Dichloropropene	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Cyclohexane	--	--	mg/kg		0.0011 U	0.0044	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Dibromochloromethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Dibromochloropropane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Dichlorodifluoromethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	MR-4	MR-4	MR-7	MR-12	MR-12	MR-14	MR-14
				Sample Date:	7/24/2018	7/24/2018	8/2/2018	7/24/2018	7/24/2018	7/30/2018	7/30/2018
				Sample Depth (ft bls):	1 - 1.5	9.5 - 11	0.5 - 2.5	1.25 - 3	3 - 4	1 - 1.5	5 - 6
Ethylbenzene	1	41	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.015	0.014	0.0011 U	0.0011 U
Freon 113	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Isopropylbenzene	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0053	0.0042	0.0011 U	0.0011 U
m+p-Xylene	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0057	0.0082	0.0011 U	0.0011 U
Methyl acetate	--	--	mg/kg		0.0056 U	0.0064 U	0.0055 U	0.0053 U	0.0051 U	0.0053 U	0.0054 U
Methylcyclohexane	--	--	mg/kg		0.0011 U	0.00023 J	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Methylene chloride	0.05	100	mg/kg		0.00044 BJ	0.0013 U	0.00021 BJ	0.0011 U	0.0020 B	0.0011 U	0.0011 U
MTBE	0.93	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
n-Butylbenzene	12	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.00023 J	0.00015 J	0.0011 U	0.0011 U
n-Propylbenzene	3.9	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0014	0.00097 J	0.0011 U	0.0011 U
o-Xylene	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0034	0.0038	0.0011 U	0.0011 U
sec-Butylbenzene	11	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.00011 J	0.001 U	0.0011 U	0.0011 U
Styrene	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.00019 J	0.00030 J	0.0011 U	0.0011 U
tert-Butylbenzene	5.9	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Tetrachloroethene	1.3	19	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.00033 J	0.00017 J
Toluene	0.7	100	mg/kg		0.0011 U	0.003	0.0011 U	0.00090 J	0.0022	0.0011 U	0.0011 U
trans-1,2-Dichloroethene	0.19	100	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
trans-1,3-Dichloropropene	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Trichloroethene	0.47	21	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.00016 J	0.0011 U
Trichlorofluoromethane	--	--	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Vinyl chloride	0.02	0.9	mg/kg		0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.0011 U
Xylenes (total)	0.26	100	mg/kg		0.0023 U	0.0026 U	0.0022 U	0.009	0.012	0.0021 U	0.0022 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-4	RX-4	RX-6	RX-6	RX-6	RX-7
				Sample Date:	9/28/2018	9/28/2018	9/28/2018	9/28/2018	9/28/2018	9/28/2018
				Sample Depth (ft bls):	0.5 - 2.5	9.5 - 11.5	0.5 - 2.5	9 - 11	14 - 16	0.5 - 2.5
1,1,1-Trichloroethane	0.68	100	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,1,2,2-Tetrachloroethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,1,2-Trichloroethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,1-Dichloroethane	0.27	26	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,1-Dichloroethene	0.33	100	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,2,3-Trichlorobenzene	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,2,4-Trichlorobenzene	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,2,4-Trimethylbenzene	3.6	52	mg/kg		0.33	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.00050 J
1,2-Dibromoethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,2-Dichlorobenzene	1.1	100	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,2-Dichloroethane	0.02	3.1	mg/kg		0.11 UT	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,2-Dichloropropane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,3,5-Trimethylbenzene	8.4	52	mg/kg		0.13	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.00046 J
1,3-Dichlorobenzene	2.4	49	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,4-Dichlorobenzene	1.8	13	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
1,4-Dioxane	0.1	13	mg/kg		5.4 U	0.018 U	0.027 U	0.019 U	0.025 U	0.021 U
2-Butanone (MEK)	0.12	100	mg/kg		0.54 U	0.0027 J	0.0067 U	0.0048 U	0.0035 J	0.0052 U
2-Hexanone	--	--	mg/kg		0.54 U	0.0046 U	0.0067 U	0.0048 U	0.0062 U	0.0052 U
4-Methyl-2-pentanone (MIBK)	--	--	mg/kg		0.54 U	0.0046 U	0.0067 U	0.0048 U	0.0062 U	0.0052 U
Acetone	0.05	100	mg/kg		0.54 U	0.011	0.0067 U	0.014	0.012	0.017
Benzene	0.06	4.8	mg/kg		**0.23**	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Bromochloromethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Bromodichloromethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Bromoform	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Bromomethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Carbon disulfide	--	--	mg/kg		0.11 U	0.00072 J	0.0013 U	0.00035 J	0.0012 U	0.00061 J
Carbon tetrachloride	0.76	2.4	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Chlorobenzene	1.1	100	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Chloroethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Chloroform	0.37	49	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Chloromethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
cis-1,2-Dichloroethene	0.25	100	mg/kg		0.039 J	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
cis-1,3-Dichloropropene	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Cyclohexane	--	--	mg/kg		0.093 J	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Dibromochloromethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Dibromochloropropane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Dichlorodifluoromethane	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-4	RX-4	RX-6	RX-6	RX-6	RX-7
				Sample Date:	9/28/2018	9/28/2018	9/28/2018	9/28/2018	9/28/2018	9/28/2018
				Sample Depth (ft bls):	0.5 - 2.5	9.5 - 11.5	0.5 - 2.5	9 - 11	14 - 16	0.5 - 2.5
Ethylbenzene	1	41	mg/kg		0.38	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Freon 113	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Isopropylbenzene	--	--	mg/kg		0.067 J	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
m+p-Xylene	--	--	mg/kg		0.61	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.00021 J
Methyl acetate	--	--	mg/kg		0.54 U	0.0046 U	0.0067 U	0.0048 U	0.0062 U	0.0052 U
Methylcyclohexane	--	--	mg/kg		0.85	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Methylene chloride	0.05	100	mg/kg		0.11 U	0.00092 U	0.00025 BJ	0.00021 BJ	0.0012 U	0.00026 BJ
MTBE	0.93	100	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
n-Butylbenzene	12	100	mg/kg		0.23	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
n-Propylbenzene	3.9	100	mg/kg		0.22	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
o-Xylene	--	--	mg/kg		0.14	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.00016 J
sec-Butylbenzene	11	100	mg/kg		0.12	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.000093 J
Styrene	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
tert-Butylbenzene	5.9	100	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Tetrachloroethene	1.3	19	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.00016 J
Toluene	0.7	100	mg/kg		0.36	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
trans-1,2-Dichloroethene	0.19	100	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
trans-1,3-Dichloropropene	--	--	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Trichloroethene	0.47	21	mg/kg		0.11 U	0.00018 BJ	0.00040 BJ	0.00096 U	0.00026 BJ	0.001 U
Trichlorofluoromethane	--	--	mg/kg		0.11 UT	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Vinyl chloride	0.02	0.9	mg/kg		0.11 U	0.00092 U	0.0013 U	0.00096 U	0.0012 U	0.001 U
Xylenes (total)	0.26	100	mg/kg		**0.75**	0.0018 U	0.0027 U	0.0019 U	0.0025 U	0.00038 J

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-9	RX-10	RX-12	RX-15	RX-16	RX-17
				Sample Date:	10/1/2018	10/1/2018	10/1/2018	01/13/2021	01/13/2021	01/13/2021
				Sample Depth (ft bls):	1.0 - 2.5	1 - 3	2.5 - 4.0	2 - 4	1.5 - 3.5	2 - 4
1,1,1-Trichloroethane	0.68	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,1,2,2-Tetrachloroethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,1,2-Trichloroethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,1-Dichloroethane	0.27	26	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,1-Dichloroethene	0.33	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,2,3-Trichlorobenzene	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,2,4-Trichlorobenzene	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,2,4-Trimethylbenzene	3.6	52	mg/kg		0.00098 U	0.0029	0.00099 U	0.0011 U	0.00055 J	0.00041 J
1,2-Dibromoethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,2-Dichlorobenzene	1.1	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,2-Dichloroethane	0.02	3.1	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,2-Dichloropropane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,3,5-Trimethylbenzene	8.4	52	mg/kg		0.00098 U	0.0012	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,3-Dichlorobenzene	2.4	49	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,4-Dichlorobenzene	1.8	13	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
1,4-Dioxane	0.1	13	mg/kg		0.02 U	0.018 U	0.02 U	0.021 U	0.019 U	0.021 U
2-Butanone (MEK)	0.12	100	mg/kg		0.0026 J	0.0016 J	0.005 U	0.0053	0.0049 U	0.006
2-Hexanone	--	--	mg/kg		0.0049 U	0.0044 U	0.005 U	0.0053 U	0.0049 U	0.0053 U
4-Methyl-2-pentanone (MIBK)	--	--	mg/kg		0.0049 U	0.0044 U	0.005 U	0.0053 U	0.0049 U	0.0053 U
Acetone	0.05	100	mg/kg		0.012	0.0088	0.005 U	0.044	0.013	**0.054**
Benzene	0.06	4.8	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.00035 J
Bromochloromethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Bromodichloromethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Bromoform	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Bromomethane	--	--	mg/kg		0.00098 UT	0.00088 UT	0.00099 UT	0.0021 U	0.0019 U	0.0021 U
Carbon disulfide	--	--	mg/kg		0.00098 U	0.00029 J	0.00099 U	0.0011 U	0.001	0.0019
Carbon tetrachloride	0.76	2.4	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 UT	0.00097 UT	0.0011 UT
Chlorobenzene	1.1	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Chloroethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Chloroform	0.37	49	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Chloromethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
cis-1,2-Dichloroethene	0.25	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
cis-1,3-Dichloropropene	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Cyclohexane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Dibromochloromethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Dibromochloropropane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Dichlorodifluoromethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-9	RX-10	RX-12	RX-15	RX-16	RX-17
				Sample Date:	10/1/2018	10/1/2018	10/1/2018	01/13/2021	01/13/2021	01/13/2021
				Sample Depth (ft bls):	1.0 - 2.5	1 - 3	2.5 - 4.0	2 - 4	1.5 - 3.5	2 - 4
Ethylbenzene	1	41	mg/kg		0.00098 U	0.00024 J	0.00099 U	0.0011 U	0.00097 U	0.00027 J
Freon 113	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Isopropylbenzene	--	--	mg/kg		0.00098 U	0.00024 J	0.00099 U	0.0011 U	0.00097 U	0.0011 U
m+p-Xylene	--	--	mg/kg		0.00046 J	0.00061 J	0.00099 U	0.0011 U	0.00036 J	0.00078 J
Methyl acetate	--	--	mg/kg		0.0049 U	0.0044 U	0.005 U	0.0053 U	0.0049 U	0.0053 U
Methylcyclohexane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Methylene chloride	0.05	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0021 U	0.0019 U	0.0021 U
MTBE	0.93	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
n-Butylbenzene	12	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
n-Propylbenzene	3.9	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
o-Xylene	--	--	mg/kg		0.00056 J	0.00070 J	0.00099 U	0.0011 U	0.00097 U	0.00055 J
sec-Butylbenzene	11	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Styrene	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
tert-Butylbenzene	5.9	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Tetrachloroethene	1.3	19	mg/kg		0.00098 U	0.00088 U	0.00022 J	0.0011 U	0.00097 U	0.0011 U
Toluene	0.7	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.0019	0.0024
trans-1,2-Dichloroethene	0.19	100	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
trans-1,3-Dichloropropene	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Trichloroethene	0.47	21	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Trichlorofluoromethane	--	--	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Vinyl chloride	0.02	0.9	mg/kg		0.00098 U	0.00088 U	0.00099 U	0.0011 U	0.00097 U	0.0011 U
Xylenes (total)	0.26	100	mg/kg		0.0010 J	0.0013 J	0.002 U	0.0021 U	0.0019 U	0.0013 J

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-18	RX-18	RX-19	RX-19	RX-20	RX-20
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021
				Sample Depth (ft bls):	2 - 4	6 - 8	0 - 2	6 - 8	2 - 4	5 - 7
1,1,1-Trichloroethane	0.68	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,1,2,2-Tetrachloroethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,1,2-Trichloroethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,1-Dichloroethane	0.27	26	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,1-Dichloroethene	0.33	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,2,3-Trichlorobenzene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,2,4-Trichlorobenzene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,2,4-Trimethylbenzene	3.6	52	mg/kg		0.00065 J	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,2-Dibromoethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,2-Dichlorobenzene	1.1	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,2-Dichloroethane	0.02	3.1	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,2-Dichloropropane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,3,5-Trimethylbenzene	8.4	52	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,3-Dichlorobenzene	2.4	49	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,4-Dichlorobenzene	1.8	13	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
1,4-Dioxane	0.1	13	mg/kg		0.024 U	0.023 U	0.024 U	0.061 U	0.024 U	0.024 U
2-Butanone (MEK)	0.12	100	mg/kg		0.01	0.0058 U	0.006 U	0.015 U	0.006 U	0.0061 U
2-Hexanone	--	--	mg/kg		0.0059 U	0.0058 U	0.006 U	0.015 U	0.006 U	0.0061 U
4-Methyl-2-pentanone (MIBK)	--	--	mg/kg		0.0059 U	0.0058 U	0.006 U	0.015 U	0.006 U	0.0061 U
Acetone	0.05	100	mg/kg		**0.091**	0.007 U	0.0077	0.032	0.026	0.0073 U
Benzene	0.06	4.8	mg/kg		0.00038 J	0.0012 U	0.00045 J	0.0031 U	0.0012 U	0.0012 U
Bromochloromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Bromodichloromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Bromoform	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Bromomethane	--	--	mg/kg		0.0024 U	0.0023 U	0.0024 U	0.0061 U	0.0024 U	0.0024 U
Carbon disulfide	--	--	mg/kg		0.0013	0.0012 U	0.0012 U	0.00088 J	0.00071 J	0.0012 U
Carbon tetrachloride	0.76	2.4	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Chlorobenzene	1.1	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Chloroethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Chloroform	0.37	49	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Chloromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
cis-1,2-Dichloroethene	0.25	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
cis-1,3-Dichloropropene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Cyclohexane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Dibromochloromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Dibromochloropropane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Dichlorodifluoromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-18	RX-18	RX-19	RX-19	RX-20	RX-20
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021
				Sample Depth (ft bls):	2 - 4	6 - 8	0 - 2	6 - 8	2 - 4	5 - 7
Ethylbenzene	1	41	mg/kg		0.0085	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Freon 113	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Isopropylbenzene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
m+p-Xylene	--	--	mg/kg		0.039	0.0012 U	0.0012 U	0.0031 U	0.00049 J	0.0012 U
Methyl acetate	--	--	mg/kg		0.0059 U	0.0058 U	0.006 U	0.015 U	0.006 U	0.0061 U
Methylcyclohexane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Methylene chloride	0.05	100	mg/kg		0.0024 U	0.0023 U	0.0024 U	0.0061 U	0.0024 U	0.0024 U
MTBE	0.93	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
n-Butylbenzene	12	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
n-Propylbenzene	3.9	100	mg/kg		0.00021 J	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
o-Xylene	--	--	mg/kg		0.018	0.0012 U	0.0012 U	0.0031 U	0.00026 J	0.0012 U
sec-Butylbenzene	11	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Styrene	--	--	mg/kg		0.0024	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
tert-Butylbenzene	5.9	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Tetrachloroethene	1.3	19	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Toluene	0.7	100	mg/kg		0.0011 J	0.0012 U	0.00029 J	0.0031 U	0.00053 J	0.0012 U
trans-1,2-Dichloroethene	0.19	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
trans-1,3-Dichloropropene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Trichloroethene	0.47	21	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Trichlorofluoromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Vinyl chloride	0.02	0.9	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0031 U	0.0012 U	0.0012 U
Xylenes (total)	0.26	100	mg/kg		0.057	0.0023 U	0.0024 U	0.0061 U	0.0024 U	0.0024 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-21	RX-21 DUP	RX-21	RX-22	RX-22	RX-23
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/12/2021
				Sample Depth (ft bls):	0 - 2	0 - 2	5 - 7	0 - 2	2 - 4	0 - 2
1,1,1-Trichloroethane	0.68	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,1,2,2-Tetrachloroethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,1,2-Trichloroethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,1-Dichloroethane	0.27	26	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,1-Dichloroethene	0.33	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,2,3-Trichlorobenzene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,2,4-Trichlorobenzene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,2,4-Trimethylbenzene	3.6	52	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,2-Dibromoethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,2-Dichlorobenzene	1.1	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,2-Dichloroethane	0.02	3.1	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,2-Dichloropropane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,3,5-Trimethylbenzene	8.4	52	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,3-Dichlorobenzene	2.4	49	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,4-Dichlorobenzene	1.8	13	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
1,4-Dioxane	0.1	13	mg/kg		0.024 U	0.023 U	0.024 U	0.023 U	0.022 U	0.021 U
2-Butanone (MEK)	0.12	100	mg/kg		0.006 U	0.0058 U	0.0061 U	0.0057 U	0.0056 U	0.0053 U
2-Hexanone	--	--	mg/kg		0.006 U	0.0058 U	0.0061 U	0.0057 U	0.0056 U	0.0053 U
4-Methyl-2-pentanone (MIBK)	--	--	mg/kg		0.006 U	0.0058 U	0.0061 U	0.0057 U	0.0056 U	0.0053 U
Acetone	0.05	100	mg/kg		0.022	0.007 U	0.0073 U	0.01	0.0067 U	0.0064 U
Benzene	0.06	4.8	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Bromochloromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Bromodichloromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Bromoform	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Bromomethane	--	--	mg/kg		0.0024 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U
Carbon disulfide	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Carbon tetrachloride	0.76	2.4	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Chlorobenzene	1.1	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Chloroethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Chloroform	0.37	49	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Chloromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
cis-1,2-Dichloroethene	0.25	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
cis-1,3-Dichloropropene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Cyclohexane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Dibromochloromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Dibromochloropropane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Dichlorodifluoromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-21	RX-21 DUP	RX-21	RX-22	RX-22	RX-23
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/12/2021
				Sample Depth (ft bls):	0 - 2	0 - 2	5 - 7	0 - 2	2 - 4	0 - 2
Ethylbenzene	1	41	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Freon 113	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Isopropylbenzene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
m+p-Xylene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Methyl acetate	--	--	mg/kg		0.006 U	0.0058 U	0.0061 U	0.0057 U	0.0056 U	0.0053 U
Methylcyclohexane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Methylene chloride	0.05	100	mg/kg		0.0024 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U
MTBE	0.93	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
n-Butylbenzene	12	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
n-Propylbenzene	3.9	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
o-Xylene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
sec-Butylbenzene	11	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Styrene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
tert-Butylbenzene	5.9	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Tetrachloroethene	1.3	19	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Toluene	0.7	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
trans-1,2-Dichloroethene	0.19	100	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
trans-1,3-Dichloropropene	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Trichloroethene	0.47	21	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Trichlorofluoromethane	--	--	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Vinyl chloride	0.02	0.9	mg/kg		0.0012 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0011 U
Xylenes (total)	0.26	100	mg/kg		0.0024 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-23	RX-24	RX-24	RX-25	RX-25	RX-30	RX-30
				Sample Date:	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	2/11/2021	2/11/2021
				Sample Depth (ft bls):	3 - 5	0 - 2	5 - 7	0 - 2	5 - 7	0.5 - 2.5	2.5 - 4.5
1,1,1-Trichloroethane	0.68	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,1,2,2-Tetrachloroethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,1,2-Trichloroethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,1-Dichloroethane	0.27	26	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,1-Dichloroethene	0.33	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,2,3-Trichlorobenzene	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,2,4-Trichlorobenzene	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,2,4-Trimethylbenzene	3.6	52	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 UT	0.0012 UT
1,2-Dibromoethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,2-Dichlorobenzene	1.1	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,2-Dichloroethane	0.02	3.1	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,2-Dichloropropane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,3,5-Trimethylbenzene	8.4	52	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 UT	0.0012 UT
1,3-Dichlorobenzene	2.4	49	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,4-Dichlorobenzene	1.8	13	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
1,4-Dioxane	0.1	13	mg/kg		0.028 U	0.028 U	0.022 U	0.021 U	0.025 U	0.021 U	0.025 U
2-Butanone (MEK)	0.12	100	mg/kg		0.0071 U	0.0071 U	0.0055 U	0.0053 U	0.0061 U	0.0054 U	0.0062 U
2-Hexanone	--	--	mg/kg		0.0071 U	0.0071 U	0.0055 U	0.0053 U	0.0061 U	0.0054 U	0.0062 U
4-Methyl-2-pentanone (MIBK)	--	--	mg/kg		0.0071 U	0.0071 U	0.0055 U	0.0053 U	0.0061 U	0.0054 U	0.0062 U
Acetone	0.05	100	mg/kg		0.0085 U	0.012	0.0066 U	0.0064 U	0.0074 U	0.013	0.0082
Benzene	0.06	4.8	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Bromochloromethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Bromodichloromethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Bromoform	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Bromomethane	--	--	mg/kg		0.0028 U	0.0028 U	0.0022 U	0.0021 U	0.0025 U	0.0021 U	0.0025 U
Carbon disulfide	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Carbon tetrachloride	0.76	2.4	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Chlorobenzene	1.1	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Chloroethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Chloroform	0.37	49	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Chloromethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
cis-1,2-Dichloroethene	0.25	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
cis-1,3-Dichloropropene	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Cyclohexane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Dibromochloromethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Dibromochloropropane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Dichlorodifluoromethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-23	RX-24	RX-24	RX-25	RX-25	RX-30	RX-30
				Sample Date:	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	2/11/2021	2/11/2021
				Sample Depth (ft bls):	3 - 5	0 - 2	5 - 7	0 - 2	5 - 7	0.5 - 2.5	2.5 - 4.5
Ethylbenzene	1	41	mg/kg		0.0014 U	0.00033 J	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Freon 113	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Isopropylbenzene	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
m+p-Xylene	--	--	mg/kg		0.00053 J	0.0014	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Methyl acetate	--	--	mg/kg		0.0071 U	0.0071 U	0.0055 U	0.0053 U	0.0061 U	0.0054 U	0.0062 U
Methylcyclohexane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Methylene chloride	0.05	100	mg/kg		0.0028 U	0.0028 U	0.0022 U	0.0021 U	0.0025 U	0.0021 U	0.0025 U
MTBE	0.93	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
n-Butylbenzene	12	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 UT	0.0012 UT
n-Propylbenzene	3.9	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
o-Xylene	--	--	mg/kg		0.00036 J	0.00092 J	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
sec-Butylbenzene	11	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 UT	0.0012 UT
Styrene	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
tert-Butylbenzene	5.9	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 UT	0.0012 UT
Tetrachloroethene	1.3	19	mg/kg		0.0014 U	0.00082 J	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Toluene	0.7	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
trans-1,2-Dichloroethene	0.19	100	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
trans-1,3-Dichloropropene	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Trichloroethene	0.47	21	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Trichlorofluoromethane	--	--	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Vinyl chloride	0.02	0.9	mg/kg		0.0014 U	0.0014 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Xylenes (total)	0.26	100	mg/kg		0.0028 U	0.0023 J	0.0022 U	0.0021 U	0.0025 U	0.0021 U	0.0025 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-31	RX-31	RX-32	RX-32 DUP	RX-32	RX-33	RX-33
				Sample Date:	2/11/2021	2/11/2021	2/10/2021	2/10/2021	2/10/2021	2/10/2021	2/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	5 - 7	0.5 - 2.5	0.5 - 2.5	4 - 6	0.5 - 2.5	9 - 11
1,1,1-Trichloroethane	0.68	100	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,1,2,2-Tetrachloroethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,1,2-Trichloroethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,1-Dichloroethane	0.27	26	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,1-Dichloroethene	0.33	100	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,2,3-Trichlorobenzene	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,2,4-Trichlorobenzene	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,2,4-Trimethylbenzene	3.6	52	mg/kg		0.0010 UT	0.0027 UT	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,2-Dibromoethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,2-Dichlorobenzene	1.1	100	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,2-Dichloroethane	0.02	3.1	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,2-Dichloropropane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,3,5-Trimethylbenzene	8.4	52	mg/kg		0.0010 UT	0.0027 UT	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,3-Dichlorobenzene	2.4	49	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,4-Dichlorobenzene	1.8	13	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
1,4-Dioxane	0.1	13	mg/kg		0.020 U	0.053 U	0.026 U	0.025 U	0.022 U	0.033 U	0.025 U
2-Butanone (MEK)	0.12	100	mg/kg		0.0050 U	0.013 U	0.0064 U	0.0062 U	0.0055 U	0.0083 U	0.0062 U
2-Hexanone	--	--	mg/kg		0.0050 U	0.013 U	0.0064 U	0.0062 U	0.0055 U	0.0083 U	0.0062 U
4-Methyl-2-pentanone (MIBK)	--	--	mg/kg		0.0050 U	0.013 U	0.0064 U	0.0062 U	0.0055 U	0.0083 U	0.0062 U
Acetone	0.05	100	mg/kg		0.0091	0.016 U	0.01	0.0096	0.018	0.0099 U	0.011
Benzene	0.06	4.8	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Bromochloromethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Bromodichloromethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Bromoform	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Bromomethane	--	--	mg/kg		0.0020 U	0.0053 U	0.0026 U	0.0025 U	0.0022 U	0.0033 U	0.0025 U
Carbon disulfide	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.00087 J	0.0011 U	0.0017 U	0.0012 U
Carbon tetrachloride	0.76	2.4	mg/kg		0.0010 U	0.0027 U	0.0013 UT	0.0012 UT	0.0011 UT	0.0017 UT	0.0012 UT
Chlorobenzene	1.1	100	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Chloroethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Chloroform	0.37	49	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Chloromethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
cis-1,2-Dichloroethene	0.25	100	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
cis-1,3-Dichloropropene	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Cyclohexane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Dibromochloromethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Dibromochloropropane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Dichlorodifluoromethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U

Table 1. Summary of Volatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-31	RX-31	RX-32	RX-32 DUP	RX-32	RX-33	RX-33
				Sample Date:	2/11/2021	2/11/2021	2/10/2021	2/10/2021	2/10/2021	2/10/2021	2/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	5 - 7	0.5 - 2.5	0.5 - 2.5	4 - 6	0.5 - 2.5	9 - 11
Ethylbenzene	1	41	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Freon 113	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Isopropylbenzene	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
m+p-Xylene	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Methyl acetate	--	--	mg/kg		0.0050 U	0.013 U	0.0064 U	0.0062 U	0.0055 U	0.0083 U	0.0062 U
Methylcyclohexane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Methylene chloride	0.05	100	mg/kg		0.0020 U	0.0053 U	0.0026 U	0.0025 U	0.0022 U	0.0033 U	0.0025 U
MTBE	0.93	100	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
n-Butylbenzene	12	100	mg/kg		0.0010 UT	0.0027 UT	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
n-Propylbenzene	3.9	100	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
o-Xylene	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
sec-Butylbenzene	11	100	mg/kg		0.0010 UT	0.0027 UT	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Styrene	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
tert-Butylbenzene	5.9	100	mg/kg		0.0010 UT	0.0027 UT	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Tetrachloroethene	1.3	19	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Toluene	0.7	100	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
trans-1,2-Dichloroethene	0.19	100	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
trans-1,3-Dichloropropene	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Trichloroethene	0.47	21	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Trichlorofluoromethane	--	--	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Vinyl chloride	0.02	0.9	mg/kg		0.0010 U	0.0027 U	0.0013 U	0.0012 U	0.0011 U	0.0017 U	0.0012 U
Xylenes (total)	0.26	100	mg/kg		0.0020 U	0.0053 U	0.0026 U	0.0025 U	0.0022 U	0.0033 U	0.0025 U

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	MR-4	MR-4	MR-7	MR-12	MR-12	MR-14	MR-14	RX-4	RX-4
				Sample Date:	7/24/2018	7/24/2018	8/2/2018	7/24/2018	7/24/2018	7/30/2018	7/30/2018	9/28/2018	9/28/2018
				Sample Depth (ft bls):	1 - 1.5	9.5 - 11	0.5 - 2.5	1.25 - 3	3 - 4	1 - 1.5	5 - 6	0.5 - 2.5	9.5 - 11.5
1,1'-Biphenyl	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.039 J	0.039 J	0.38 U	0.38 U	0.064 J	0.38 U
1,2,4,5-Tetrachlorobenzene	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
2,3,4,6-Tetrachlorophenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
2,4,5-Trichlorophenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
2,4,6-Trichlorophenol	--	--	mg/kg		0.15 U	0.15 U	0.15 U	0.16 U	0.16 U	0.15 U	0.15 U	0.3 U	0.15 U
2,4-Dichlorophenol	--	--	mg/kg		0.15 U	0.15 U	0.15 U	0.16 U	0.16 U	0.15 U	0.15 U	0.3 U	0.15 U
2,4-Dimethylphenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.024 J	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
2,4-Dinitrophenol	--	--	mg/kg		0.29 U	0.31 U	0.29 U	0.32 U	0.32 U	0.31 U	0.3 U	0.6 U	0.31 U
2,4-Dinitrotoluene	--	--	mg/kg		0.073 U	0.077 U	0.073 U	0.08 U	0.08 U	0.078 U	0.077 U	0.15 U	0.077 U
2,6-Dinitrotoluene	--	--	mg/kg		0.073 U	0.077 U	0.073 U	0.08 U	0.08 U	0.078 U	0.077 U	0.15 U	0.077 U
2-Chloronaphthalene	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
2-Chlorophenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
2-Methylnaphthalene	--	--	mg/kg		0.011 J	0.38 U	0.43	0.27 J	0.22 J	0.017 J	0.38 U	1.3	0.38 U
2-Methylphenol	0.33	100	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
2-Nitroaniline	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
2-Nitrophenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
3&4-Methylphenol	0.33	100	mg/kg		0.36 U	0.38 U	0.016 J	0.39 U	0.4 U	0.38 U	0.38 U	0.033 J	0.38 U
3,3'-Dichlorobenzidine	--	--	mg/kg		0.15 U	0.15 U	0.15 U	0.16 U	0.16 U	0.15 U	0.15 U	0.3 U	0.15 U
3-Nitroaniline	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
4,6-Dinitro-2-methylphenol	--	--	mg/kg		0.29 U	0.31 U	0.29 U	0.32 U	0.32 U	0.31 U	0.3 U	0.6 U	0.31 U
4-Bromophenyl phenyl ether	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
4-Chloro-3-methylphenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
4-Chloroaniline	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
4-Chlorophenyl phenyl ether	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
4-Methylphenol	0.33	100	mg/kg		0.36 U	0.38 U	0.016 J	0.39 U	0.4 U	0.38 U	0.38 U	0.033 J	0.38 U
4-Nitroaniline	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
4-Nitrophenol	--	--	mg/kg		0.73 U	0.77 U	0.73 U	0.8 U	0.8 U	0.78 U	0.77 U	1.5 U	0.77 U
Acenaphthene	20	100	mg/kg		0.36 U	0.38 U	0.36 U	0.29 J	0.30 J	0.043 J	0.38 U	0.14 J	0.38 U
Acenaphthylene	100	100	mg/kg		0.014 J	0.38 U	0.36 U	0.39 U	0.4 U	0.025 J	0.016 J	0.083 J	0.014 J
Acetophenone	--	--	mg/kg		0.36 U	0.38 U	0.072 J	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
Anthracene	100	100	mg/kg		0.057 J	0.047 J	0.16 J	0.13 J	0.24 J	0.14 J	0.074 J	0.20 J	0.029 J
Atrazine	--	--	mg/kg		0.15 U	0.15 U	0.15 U	0.16 U	0.16 U	0.15 U	0.15 U	0.3 U	0.15 U
Benzaldehyde	--	--	mg/kg		0.36 UT	0.38 UT	0.36 U	0.39 UT	0.4 UT	0.38 U	0.38 U	0.74 U	0.38 U
Benzo[a]anthracene	1	1	mg/kg		0.25	0.14	0.036 U	0.17	0.19	0.71	0.34	0.46	0.030 J
Benzo[a]pyrene	1	1	mg/kg		0.25	0.13	0.036 U	0.096	0.1	0.58	0.3	0.47	0.025 J
Benzo[b]fluoranthene	1	1	mg/kg		0.34	0.14	0.036 U	0.14	0.15	0.75	0.38	0.83	0.043
Benzo[g,h,i]perylene	100	100	mg/kg		0.19 J	0.075 J	0.36 U	0.039 J	0.046 J	0.32 J	0.19 J	0.28 J	0.38 U
Benzo[k]fluoranthene	0.8	3.9	mg/kg		0.11	0.069	0.036 U	0.058	0.04 U	0.3	0.16	0.26	0.016 J
Bis(2-chloro-1-methylethyl)ether	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
Bis(2-chloroethoxy)methane	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
Bis(2-chloroethyl) ether	--	--	mg/kg		0.036 U	0.038 U	0.036 U	0.039 U	0.04 U	0.038 U	0.038 U	0.074 UT	0.038 UT
Bis(2-ethylhexyl) phthalate	--	--	mg/kg		0.15 J	0.38 U	0.36 U	0.32 J	0.56	0.4	0.24 J	1.2	0.38 U

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	MR-4	MR-4	MR-7	MR-12	MR-12	MR-14	MR-14	RX-4	RX-4
				Sample Date:	7/24/2018	7/24/2018	8/2/2018	7/24/2018	7/24/2018	7/30/2018	7/30/2018	9/28/2018	9/28/2018
				Sample Depth (ft bls):	1 - 1.5	9.5 - 11	0.5 - 2.5	1.25 - 3	3 - 4	1 - 1.5	5 - 6	0.5 - 2.5	9.5 - 11.5
Butylbenzyl phthalate	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.83	1.3	0.38 U	0.38 U	0.12 J	0.38 U
Caprolactam	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
Carbazole	--	--	mg/kg		0.027 J	0.016 J	0.36 U	0.21 J	0.34 J	0.043 J	0.021 J	0.084 J	0.38 U
Chrysene	1	3.9	mg/kg		0.26 J	0.12 J	0.36 U	0.18 J	0.20 J	0.78	0.35 J	0.53 J	0.031 J
Dibenzo[a,h]anthracene	0.33	0.33	mg/kg		0.041	0.020 J	0.036 U	0.039 U	0.04 U	0.089	0.04	0.070 J	0.038 U
Dibenzofuran	7	59	mg/kg		0.36 U	0.38 U	0.36 U	0.25 J	0.21 J	0.016 J	0.012 J	0.13 J	0.38 U
Diethyl phthalate	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.036 J	0.38 U
Dimethyl phthalate	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
Di-n-butyl phthalate	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.31 J	0.38 U
Di-n-octyl phthalate	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
Fluoranthene	100	100	mg/kg		0.45	0.24 J	0.36 U	0.73	0.97	1.3	0.6	0.94	0.057 J
Fluorene	30	100	mg/kg		0.017 J	0.013 J	0.63	0.36 J	0.4	0.033 J	0.017 J	0.25 J	0.38 U
Hexachlorobenzene	0.33	1.2	mg/kg		0.036 U	0.038 U	0.036 U	0.039 U	0.04 U	0.038 U	0.038 U	0.074 U	0.038 U
Hexachlorobutadiene	--	--	mg/kg		0.073 U	0.077 U	0.073 U	0.08 U	0.08 U	0.078 UT	0.077 UT	0.15 U	0.077 U
Hexachlorocyclopentadiene	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
Hexachloroethane	--	--	mg/kg		0.036 U	0.038 U	0.036 U	0.039 U	0.04 U	0.038 U	0.038 U	0.074 UT	0.038 UT
Indeno[1,2,3-cd]pyrene	0.5	0.5	mg/kg		0.19	0.079	0.036 U	0.043	0.054	0.39	0.22	0.28	0.021 J
Isophorone	--	--	mg/kg		0.15 U	0.15 U	0.15 U	0.16 U	0.16 U	0.15 U	0.15 U	0.3 U	0.15 U
Naphthalene	12	100	mg/kg		0.014 J	0.014 J	0.36 U	1.9	1.8	0.034 J	0.012 J	0.71 J	0.38 U
Nitrobenzene	--	--	mg/kg		0.036 U	0.038 U	0.036 U	0.039 U	0.04 U	0.038 U	0.038 U	0.074 UT	0.038 UT
n-Nitrosodi-n-propylamine	--	--	mg/kg		0.036 U	0.038 U	0.036 U	0.039 U	0.04 U	0.038 U	0.038 U	0.074 U	0.038 U
n-Nitrosodiphenylamine	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.39 U	0.4 U	0.38 U	0.38 U	0.74 U	0.38 U
Pentachlorophenol	0.8	6.7	mg/kg		0.29 U	0.31 U	0.29 U	0.32 U	0.32 U	0.31 U	0.3 U	0.6 U	0.31 U
Phenanthrene	100	100	mg/kg		0.23 J	0.16 J	1.3	1.2	1.4	0.65	0.32 J	1	0.038 J
Phenol	0.33	100	mg/kg		0.36 UT	0.38 UT	0.018 J	0.39 UT	0.4 UT	0.38 U	0.38 U	0.74 U	0.38 U
Pyrene	100	100	mg/kg		0.47	0.26 J	0.36 U	0.63	0.86	1.4	0.63	1.3	0.046 J

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-6	RX-6	RX-6	RX-7	RX-9	RX-10	RX-12	RX-15	RX-16
				Sample Date:	9/28/2018	9/28/2018	9/28/2018	9/28/2018	10/1/2018	10/1/2018	10/1/2018	01/13/2021	01/13/2021
				Sample Depth (ft bls):	0.5 - 2.5	9 - 11	14 - 16	0.5 - 2.5	1.0 - 2.5	1 - 3	2.5 - 4.0	2 - 4	1.5 - 3.5
1,1'-Biphenyl	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.032 J	0.36 U	0.38 U	0.39 U
1,2,4,5-Tetrachlorobenzene	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
2,3,4,6-Tetrachlorophenol	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
2,4,5-Trichlorophenol	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
2,4,6-Trichlorophenol	--	--	mg/kg		0.18 U	0.15 U	0.17 U	0.15 U	0.16 U	0.15 U	0.14 U	0.15 U	0.16 U
2,4-Dichlorophenol	--	--	mg/kg		0.18 U	0.15 U	0.17 U	0.15 U	0.16 U	0.15 U	0.14 U	0.15 U	0.16 U
2,4-Dimethylphenol	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
2,4-Dinitrophenol	--	--	mg/kg		0.37 U	0.31 U	0.33 U	0.3 U	0.32 U	0.3 U	0.29 U	0.31 U	0.31 U
2,4-Dinitrotoluene	--	--	mg/kg		0.093 U	0.078 U	0.083 U	0.075 U	0.08 U	0.075 U	0.072 U	0.078 U	0.079 U
2,6-Dinitrotoluene	--	--	mg/kg		0.093 U	0.078 U	0.083 U	0.075 U	0.08 U	0.075 U	0.072 U	0.078 U	0.079 U
2-Chloronaphthalene	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
2-Chlorophenol	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
2-Methylnaphthalene	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.035 J	0.010 J	0.11 J	0.014 J	0.011 J	0.037 J
2-Methylphenol	0.33	100	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
2-Nitroaniline	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
2-Nitrophenol	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
3&4-Methylphenol	0.33	100	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
3,3'-Dichlorobenzidine	--	--	mg/kg		0.18 U	0.15 U	0.17 U	0.15 U	0.16 U	0.15 U	0.14 U	0.15 U	0.16 U
3-Nitroaniline	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
4,6-Dinitro-2-methylphenol	--	--	mg/kg		0.37 U	0.31 U	0.33 U	0.3 U	0.32 U	0.3 U	0.29 U	0.31 U	0.31 U
4-Bromophenyl phenyl ether	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
4-Chloro-3-methylphenol	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
4-Chloroaniline	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
4-Chlorophenyl phenyl ether	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
4-Methylphenol	0.33	100	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
4-Nitroaniline	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
4-Nitrophenol	--	--	mg/kg		0.93 U	0.78 U	0.83 U	0.75 U	0.8 U	0.75 U	0.72 U	0.78 U	0.79 U
Acenaphthene	20	100	mg/kg		0.46 U	0.38 U	0.41 U	0.027 J	0.39 U	0.29 J	0.053 J	0.026 J	0.13 J
Acenaphthylene	100	100	mg/kg		0.0089 J	0.38 U	0.41 U	0.035 J	0.021 J	0.37 U	0.026 J	0.38 U	0.39 U
Acetophenone	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Anthracene	100	100	mg/kg		0.066 J	0.030 J	0.41 U	0.067 J	0.39 U	0.53	0.15 J	0.087 J	0.13 J
Atrazine	--	--	mg/kg		0.18 U	0.15 U	0.17 U	0.15 U	0.16 U	0.15 U	0.14 U	0.15 U	0.16 U
Benzaldehyde	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Benzo[a]anthracene	1	1	mg/kg		0.24	0.08	0.041 U	0.23	0.034 J	0.36	0.56	0.17	0.16
Benzo[a]pyrene	1	1	mg/kg		0.22	0.067	0.041 U	0.24	0.025 J	0.15	0.44	0.11	0.11
Benzo[b]fluoranthene	1	1	mg/kg		0.29	0.087	0.041 U	0.34	0.041	0.23	0.55	0.16	0.14
Benzo[g,h,i]perylene	100	100	mg/kg		0.15 J	0.044 J	0.41 U	0.15 J	0.022 J	0.058 J	0.27 J	0.045 J	0.046 J
Benzo[k]fluoranthene	0.8	3.9	mg/kg		0.1	0.031 J	0.041 U	0.097	0.012 J	0.13	0.13	0.074	0.061
Bis(2-chloro-1-methylethyl)ether	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Bis(2-chloroethoxy)methane	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Bis(2-chloroethyl) ether	--	--	mg/kg		0.046 UT	0.038 UT	0.041 UT	0.037 UT	0.039 U	0.037 U	0.036 U	0.038 U	0.039 U
Bis(2-ethylhexyl) phthalate	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.065 J	0.023 J	0.034 J	0.4

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-6	RX-6	RX-6	RX-7	RX-9	RX-10	RX-12	RX-15	RX-16
				Sample Date:	9/28/2018	9/28/2018	9/28/2018	9/28/2018	10/1/2018	10/1/2018	10/1/2018	01/13/2021	01/13/2021
				Sample Depth (ft bls):	0.5 - 2.5	9 - 11	14 - 16	0.5 - 2.5	1.0 - 2.5	1 - 3	2.5 - 4.0	2 - 4	1.5 - 3.5
Butylbenzyl phthalate	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.027 J	0.037 J	0.38 U	0.66
Caprolactam	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.14 J	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Carbazole	--	--	mg/kg		0.017 J	0.013 J	0.41 U	0.016 J	0.39 U	0.18 J	0.047 J	0.015 J	0.052 J
Chrysene	1	3.9	mg/kg		0.25 J	0.071 J	0.41 U	0.27 J	0.030 J	0.35 J	0.58	0.17 J	0.16 J
Dibenzo[a,h]anthracene	0.33	0.33	mg/kg		0.041 J	0.038 U	0.041 U	0.039	0.039 U	0.017 J	0.064	0.038 U	0.039 U
Dibenzofuran	7	59	mg/kg		0.46 U	0.38 U	0.41 U	0.018 J	0.017 J	0.32 J	0.018 J	0.018 J	0.11 J
Diethyl phthalate	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Dimethyl phthalate	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Di-n-butyl phthalate	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.082 J
Di-n-octyl phthalate	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Fluoranthene	100	100	mg/kg		0.46	0.15 J	0.41 U	0.39	0.063 J	2.2	0.87	0.66	0.57
Fluorene	30	100	mg/kg		0.016 J	0.013 J	0.41 U	0.034 J	0.014 J	0.56	0.048 J	0.04 J	0.17 J
Hexachlorobenzene	0.33	1.2	mg/kg		0.046 U	0.038 U	0.041 U	0.037 U	0.039 U	0.037 U	0.036 U	0.038 U	0.039 U
Hexachlorobutadiene	--	--	mg/kg		0.093 U	0.078 U	0.083 U	0.075 U	0.08 U	0.075 U	0.072 U	0.078 U	0.079 U
Hexachlorocyclopentadiene	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Hexachloroethane	--	--	mg/kg		0.046 UT	0.038 UT	0.041 UT	0.037 UT	0.039 U	0.037 U	0.036 U	0.038 U	0.039 U
Indeno[1,2,3-cd]pyrene	0.5	0.5	mg/kg		0.16	0.046	0.041 U	0.16	0.026 J	0.07	0.31	0.05	0.055
Isophorone	--	--	mg/kg		0.18 U	0.15 U	0.17 U	0.15 U	0.16 U	0.15 U	0.14 U	0.15 U	0.16 U
Naphthalene	12	100	mg/kg		0.46 U	0.38 U	0.41 U	0.040 J	0.037 J	0.42	0.016 J	0.054 J	0.099 J
Nitrobenzene	--	--	mg/kg		0.046 UT	0.038 UT	0.041 UT	0.037 UT	0.039 U	0.037 U	0.036 U	0.038 U	0.039 U
n-Nitrosodi-n-propylamine	--	--	mg/kg		0.046 U	0.038 U	0.041 U	0.037 U	0.039 U	0.037 U	0.036 U	0.038 U	0.039 U
n-Nitrosodiphenylamine	--	--	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Pentachlorophenol	0.8	6.7	mg/kg		0.37 U	0.31 U	0.33 U	0.3 U	0.32 U	0.3 U	0.29 U	0.31 U	0.31 U
Phenanthrene	100	100	mg/kg		0.30 J	0.12 J	0.41 U	0.22 J	0.040 J	2.8	0.79	0.19 J	0.74
Phenol	0.33	100	mg/kg		0.46 U	0.38 U	0.41 U	0.37 U	0.39 U	0.37 U	0.36 U	0.38 U	0.39 U
Pyrene	100	100	mg/kg		0.48	0.16 J	0.41 U	0.4	0.049 J	1.7	1.1	0.61	0.52

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-17	RX-18	RX-18	RX-19	RX-19	RX-20	RX-20	RX-21
				Sample Date:	01/13/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021
				Sample Depth (ft bls):	2 - 4	2 - 4	6 - 8	0 - 2	6 - 8	2 - 4	5 - 7	0 - 2
1,1'-Biphenyl	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.02 J	0.098 J	0.36 U
1,2,4,5-Tetrachlorobenzene	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
2,3,4,6-Tetrachlorophenol	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
2,4,5-Trichlorophenol	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
2,4,6-Trichlorophenol	--	--	mg/kg		0.16 U	0.14 U	0.14 U	0.14 U	0.14 U	0.15 U	0.74 U	0.14 U
2,4-Dichlorophenol	--	--	mg/kg		0.16 U	0.14 U	0.14 U	0.14 U	0.14 U	0.15 U	0.74 U	0.14 U
2,4-Dimethylphenol	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
2,4-Dinitrophenol	--	--	mg/kg		0.32 U	0.29 U	0.28 U	0.29 U	0.28 U	0.29 U	1.5 U	0.29 U
2,4-Dinitrotoluene	--	--	mg/kg		0.08 U	0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.37 U	0.072 U
2,6-Dinitrotoluene	--	--	mg/kg		0.08 U	0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.37 U	0.072 U
2-Chloronaphthalene	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
2-Chlorophenol	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
2-Methylnaphthalene	--	--	mg/kg		0.024 J	0.057 J	0.35 U	0.36 U	0.35 U	0.089 J	0.19 J	0.014 J
2-Methylphenol	0.33	100	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
2-Nitroaniline	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
2-Nitrophenol	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
3&4-Methylphenol	0.33	100	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
3,3'-Dichlorobenzidine	--	--	mg/kg		0.16 U	0.14 U	0.14 U	0.14 U	0.14 U	0.15 U	0.74 U	0.14 U
3-Nitroaniline	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
4,6-Dinitro-2-methylphenol	--	--	mg/kg		0.32 U	0.29 U	0.28 U	0.29 U	0.28 U	0.29 U	1.5 U	0.29 U
4-Bromophenyl phenyl ether	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
4-Chloro-3-methylphenol	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
4-Chloroaniline	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
4-Chlorophenyl phenyl ether	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
4-Methylphenol	0.33	100	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
4-Nitroaniline	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
4-Nitrophenol	--	--	mg/kg		0.8 U	0.72 U	0.71 U	0.73 U	0.72 U	0.73 U	3.7 U	0.72 U
Acenaphthene	20	100	mg/kg		0.039 J	0.015 J	0.35 U	0.36 U	0.35 U	0.079 J	0.84 J	0.021 J
Acenaphthylene	100	100	mg/kg		0.39 U	0.013 J	0.35 U	0.36 U	0.35 U	0.09 J	0.67 J	0.023 J
Acetophenone	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Anthracene	100	100	mg/kg		0.065 J	0.026 J	0.35 U	0.36 U	0.35 U	0.37	4.1	0.076 J
Atrazine	--	--	mg/kg		0.16 U	0.14 U	0.14 U	0.14 U	0.14 U	0.15 U	0.74 U	0.14 U
Benzaldehyde	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Benzo[a]anthracene	1	1	mg/kg		0.089	0.1	0.022 J	0.026 J	0.042	**1.4**	**11**	0.36
Benzo[a]pyrene	1	1	mg/kg		0.05	0.13	0.015 J	0.03 J	0.042	**1.9**	**13**	0.43
Benzo[b]fluoranthene	1	1	mg/kg		0.078	0.17	0.016 J	0.046	0.054	**2.3**	**15**	0.57
Benzo[g,h,i]perylene	100	100	mg/kg		0.022 J	0.076 J	0.35 U	0.035 J	0.025 J	0.78	7.1	0.25 J
Benzo[k]fluoranthene	0.8	3.9	mg/kg		0.028 J	0.062	0.009 J	0.017 J	0.023 J	0.72	**5.3**	0.19
Bis(2-chloro-1-methylethyl)ether	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Bis(2-chloroethoxy)methane	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Bis(2-chloroethyl) ether	--	--	mg/kg		0.039 U	0.035 U	0.035 U	0.036 U	0.035 U	0.036 U	0.18 U	0.036 U
Bis(2-ethylhexyl) phthalate	--	--	mg/kg		0.39 U	0.65	0.35 U	0.17 J	0.35 U	0.52	1.8 U	0.21 J

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-17	RX-18	RX-18	RX-19	RX-19	RX-20	RX-20	RX-21
				Sample Date:	01/13/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021
				Sample Depth (ft bls):	2 - 4	2 - 4	6 - 8	0 - 2	6 - 8	2 - 4	5 - 7	0 - 2
Butylbenzyl phthalate	--	--	mg/kg		0.39 U	0.12 J	0.35 U	0.36 U	0.35 U	0.017 J	1.8 U	0.026 J
Caprolactam	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Carbazole	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.059 J	0.63 J	0.022 J
Chrysene	1	3.9	mg/kg		0.078 J	0.12 J	0.016 J	0.03 J	0.04 J	**1.2**	**10**	0.34 J
Dibenzo[a,h]anthracene	0.33	0.33	mg/kg		0.039 U	0.028 J	0.035 U	0.036 U	0.035 U	0.21	**2**	0.076
Dibenzofuran	7	59	mg/kg		0.045 J	0.35 U	0.35 U	0.36 U	0.35 U	0.071 J	0.73 J	0.015 J
Diethyl phthalate	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Dimethyl phthalate	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Di-n-butyl phthalate	--	--	mg/kg		0.39 U	0.033 J	0.35 U	0.36 U	0.026 J	0.36 U	1.8 U	0.36 U
Di-n-octyl phthalate	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Fluoranthene	100	100	mg/kg		0.3 J	0.19 J	0.024 J	0.039 J	0.074 J	2.3	22	0.65
Fluorene	30	100	mg/kg		0.062 J	0.02 J	0.35 U	0.36 U	0.35 U	0.077 J	1.2 J	0.021 J
Hexachlorobenzene	0.33	1.2	mg/kg		0.039 U	0.035 U	0.035 U	0.036 U	0.035 U	0.036 U	0.18 U	0.036 U
Hexachlorobutadiene	--	--	mg/kg		0.08 U	0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.37 U	0.072 U
Hexachlorocyclopentadiene	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Hexachloroethane	--	--	mg/kg		0.039 U	0.035 U	0.035 U	0.036 U	0.035 U	0.036 U	0.18 U	0.036 U
Indeno[1,2,3-cd]pyrene	0.5	0.5	mg/kg		0.024 J	0.074	0.035 U	0.03 J	0.03 J	**1**	**8.4**	0.24
Isophorone	--	--	mg/kg		0.16 U	0.14 U	0.14 U	0.14 U	0.14 U	0.15 U	0.74 U	0.14 U
Naphthalene	12	100	mg/kg		0.045 J	0.038 J	0.35 U	0.36 U	0.35 U	0.12 J	0.35 J	0.014 J
Nitrobenzene	--	--	mg/kg		0.039 U	0.035 U	0.035 U	0.036 U	0.035 U	0.036 U	0.18 U	0.036 U
n-Nitrosodi-n-propylamine	--	--	mg/kg		0.039 U	0.035 U	0.035 U	0.036 U	0.035 U	0.036 U	0.18 U	0.036 U
n-Nitrosodiphenylamine	--	--	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Pentachlorophenol	0.8	6.7	mg/kg		0.32 U	0.29 U	0.28 U	0.29 U	0.28 U	0.29 U	1.5 U	0.29 U
Phenanthrene	100	100	mg/kg		0.37 J	0.1 J	0.012 J	0.019 J	0.043 J	1	13	0.38
Phenol	0.33	100	mg/kg		0.39 U	0.35 U	0.35 U	0.36 U	0.35 U	0.36 U	1.8 U	0.36 U
Pyrene	100	100	mg/kg		0.28 J	0.19 J	0.023 J	0.039 J	0.06 J	2.4	21	0.59

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-21 DUP	RX-21	RX-22	RX-22	RX-23	RX-23	RX-24	RX-24
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021
				Sample Depth (ft bls):	0 - 2	5 - 7	0 - 2	2 - 4	0 - 2	3 - 5	0 - 2	5 - 7
1,1'-Biphenyl	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
1,2,4,5-Tetrachlorobenzene	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
2,3,4,6-Tetrachlorophenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
2,4,5-Trichlorophenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
2,4,6-Trichlorophenol	--	--	mg/kg		0.14 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U	0.15 U
2,4-Dichlorophenol	--	--	mg/kg		0.14 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U	0.15 U
2,4-Dimethylphenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
2,4-Dinitrophenol	--	--	mg/kg		0.29 U	0.31 U	0.29 U	0.3 U	0.31 U	0.3 U	0.32 U	0.29 U
2,4-Dinitrotoluene	--	--	mg/kg		0.072 U	0.077 U	0.074 U	0.076 U	0.077 U	0.076 U	0.082 U	0.074 U
2,6-Dinitrotoluene	--	--	mg/kg		0.072 U	0.077 U	0.074 U	0.076 U	0.077 U	0.076 U	0.082 U	0.074 U
2-Chloronaphthalene	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
2-Chlorophenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
2-Methylnaphthalene	--	--	mg/kg		0.013 J	0.38 U	0.01 J	0.37 U	0.38 U	0.012 J	0.016 J	0.015 J
2-Methylphenol	0.33	100	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
2-Nitroaniline	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
2-Nitrophenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
3&4-Methylphenol	0.33	100	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
3,3'-Dichlorobenzidine	--	--	mg/kg		0.14 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U	0.15 U
3-Nitroaniline	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
4,6-Dinitro-2-methylphenol	--	--	mg/kg		0.29 U	0.31 U	0.29 U	0.3 U	0.31 U	0.3 U	0.32 U	0.29 U
4-Bromophenyl phenyl ether	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
4-Chloro-3-methylphenol	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
4-Chloroaniline	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
4-Chlorophenyl phenyl ether	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
4-Methylphenol	0.33	100	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
4-Nitroaniline	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
4-Nitrophenol	--	--	mg/kg		0.72 U	0.77 U	0.74 U	0.76 U	0.77 U	0.76 U	0.82 U	0.74 U
Acenaphthene	20	100	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.037 J
Acenaphthylene	100	100	mg/kg		0.023 J	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.024 J	0.035 J
Acetophenone	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Anthracene	100	100	mg/kg		0.03 J	0.38 U	0.36 U	0.37 U	0.38 U	0.021 J	0.024 J	0.11 J
Atrazine	--	--	mg/kg		0.14 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U	0.15 U
Benzaldehyde	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Benzo[a]anthracene	1	1	mg/kg		0.18	0.034 J	0.083	0.037 U	0.029 J	0.1	0.11	0.37
Benzo[a]pyrene	1	1	mg/kg		0.22	0.027 J	0.096	0.037 U	0.024 J	0.11	0.14	0.44
Benzo[b]fluoranthene	1	1	mg/kg		0.31	0.034 J	0.12	0.037 U	0.032 J	0.16	0.19	0.55
Benzo[g,h,i]perylene	100	100	mg/kg		0.11 J	0.38 U	0.065 J	0.37 U	0.38 U	0.049 J	0.088 J	0.2 J
Benzo[k]fluoranthene	0.8	3.9	mg/kg		0.12	0.011 J	0.048	0.037 U	0.013 J	0.05	0.061	0.2
Bis(2-chloro-1-methylethyl)ether	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Bis(2-chloroethoxy)methane	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Bis(2-chloroethyl) ether	--	--	mg/kg		0.036 U	0.038 U	0.036 U	0.037 U	0.038 U	0.037 U	0.04 U	0.037 U
Bis(2-ethylhexyl) phthalate	--	--	mg/kg		0.47	0.38 U	0.27 J	0.37 U	0.38 U	0.37 U	0.38 J	0.37 U

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-21 DUP	RX-21	RX-22	RX-22	RX-23	RX-23	RX-24	RX-24
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021
				Sample Depth (ft bls):	0 - 2	5 - 7	0 - 2	2 - 4	0 - 2	3 - 5	0 - 2	5 - 7
Butylbenzyl phthalate	--	--	mg/kg		0.053 J	0.38 U	0.027 J	0.37 U	0.38 U	0.37 U	0.065 J	0.37 U
Caprolactam	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Carbazole	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.054 J
Chrysene	1	3.9	mg/kg		0.18 J	0.026 J	0.11 J	0.37 U	0.021 J	0.1 J	0.11 J	0.38
Dibenzo[a,h]anthracene	0.33	0.33	mg/kg		0.037	0.038 U	0.036 U	0.037 U	0.038 U	0.037 U	0.027 J	0.053
Dibenzofuran	7	59	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.043 J
Diethyl phthalate	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Dimethyl phthalate	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Di-n-butyl phthalate	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.046 J	0.016 J	0.37 U
Di-n-octyl phthalate	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Fluoranthene	100	100	mg/kg		0.29 J	0.045 J	0.12 J	0.37 U	0.037 J	0.19 J	0.18 J	0.76
Fluorene	30	100	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.039 J
Hexachlorobenzene	0.33	1.2	mg/kg		0.036 U	0.038 U	0.036 U	0.037 U	0.038 U	0.037 U	0.04 U	0.037 U
Hexachlorobutadiene	--	--	mg/kg		0.072 U	0.077 U	0.074 U	0.076 U	0.077 U	0.076 U	0.082 U	0.074 U
Hexachlorocyclopentadiene	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Hexachloroethane	--	--	mg/kg		0.036 U	0.038 U	0.036 U	0.037 U	0.038 U	0.037 U	0.04 U	0.037 U
Indeno[1,2,3-cd]pyrene	0.5	0.5	mg/kg		0.11	0.038 U	0.048	0.037 U	0.018 J	0.067	0.08	0.29
Isophorone	--	--	mg/kg		0.14 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U	0.15 U
Naphthalene	12	100	mg/kg		0.36 U	0.38 U	0.041 J	0.37 U	0.38 U	0.37 U	0.014 J	0.026 J
Nitrobenzene	--	--	mg/kg		0.036 U	0.038 U	0.036 U	0.037 U	0.038 U	0.037 U	0.04 U	0.037 U
n-Nitrosodi-n-propylamine	--	--	mg/kg		0.036 U	0.038 U	0.036 U	0.037 U	0.038 U	0.037 U	0.04 U	0.037 U
n-Nitrosodiphenylamine	--	--	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Pentachlorophenol	0.8	6.7	mg/kg		0.29 U	0.31 U	0.29 U	0.3 U	0.31 U	0.3 U	0.32 U	0.29 U
Phenanthrene	100	100	mg/kg		0.12 J	0.023 J	0.072 J	0.37 U	0.016 J	0.12 J	0.087 J	0.39
Phenol	0.33	100	mg/kg		0.36 U	0.38 U	0.36 U	0.37 U	0.38 U	0.37 U	0.4 U	0.37 U
Pyrene	100	100	mg/kg		0.28 J	0.036 J	0.16 J	0.37 U	0.032 J	0.18 J	0.16 J	0.63

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-25	RX-25	RX-30	RX-30	RX-31	RX-31	RX-32	RX-32 DUP	RX-32
				Sample Date:	01/12/2021	01/12/2021	2/11/2021	2/11/2021	2/11/2021	2/11/2021	2/10/2021	2/10/2021	2/10/2021
				Sample Depth (ft bls):	0 - 2	5 - 7	0.5 - 2.5	2.5 - 4.5	0.5 - 2.5	5 - 7	0.5 - 2.5	0.5 - 2.5	4 - 6
1,1'-Biphenyl	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
1,2,4,5-Tetrachlorobenzene	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
2,3,4,6-Tetrachlorophenol	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
2,4,5-Trichlorophenol	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
2,4,6-Trichlorophenol	--	--	mg/kg		0.15 U	0.15 U	0.14 U	0.14 U	0.15 U	0.15 U	0.14 U	0.14 U	0.15 U
2,4-Dichlorophenol	--	--	mg/kg		0.15 U	0.15 U	0.14 U	0.14 U	0.15 U	0.15 U	0.14 U	0.14 U	0.15 U
2,4-Dimethylphenol	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
2,4-Dinitrophenol	--	--	mg/kg		0.29 U	0.3 U	0.29 U	0.28 U	0.29 U	0.29 U	0.28 U	0.28 U	0.29 U
2,4-Dinitrotoluene	--	--	mg/kg		0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U	0.071 U	0.071 U	0.073 U
2,6-Dinitrotoluene	--	--	mg/kg		0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U	0.071 U	0.071 U	0.073 U
2-Chloronaphthalene	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
2-Chlorophenol	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
2-Methylnaphthalene	--	--	mg/kg		0.36 U	0.023 J	0.047 J	0.35 U	0.020 J	0.058 J	0.35 U	0.35 U	0.015 J
2-Methylphenol	0.33	100	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
2-Nitroaniline	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
2-Nitrophenol	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
3&4-Methylphenol	0.33	100	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
3,3'-Dichlorobenzidine	--	--	mg/kg		0.15 U	0.15 U	0.14 U	0.14 U	0.15 U	0.15 U	0.14 U	0.14 U	0.15 U
3-Nitroaniline	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
4,6-Dinitro-2-methylphenol	--	--	mg/kg		0.29 U	0.3 U	0.29 U	0.28 U	0.29 U	0.29 U	0.28 U	0.28 U	0.29 U
4-Bromophenyl phenyl ether	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
4-Chloro-3-methylphenol	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
4-Chloroaniline	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
4-Chlorophenyl phenyl ether	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
4-Methylphenol	0.33	100	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
4-Nitroaniline	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
4-Nitrophenol	--	--	mg/kg		0.74 U	0.74 U	0.72 U	0.71 U	0.73 U	0.73 U	0.71 U	0.71 U	0.73 U
Acenaphthene	20	100	mg/kg		0.36 U	0.081 J	0.027 J	0.35 U	0.014 J	0.047 J	0.35 U	0.35 U	0.073 J
Acenaphthylene	100	100	mg/kg		0.36 U	0.047 J	0.043 J	0.35 U	0.15 J	0.029 J	0.35 U	0.35 U	0.016 J
Acetophenone	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Anthracene	100	100	mg/kg		0.025 J	0.27 J	0.10 J	0.019 J	0.10 J	0.035 J	0.35 U	0.35 U	0.23 J
Atrazine	--	--	mg/kg		0.15 U	0.15 U	0.14 U	0.14 U	0.15 U	0.15 U	0.14 U	0.14 U	0.15 U
Benzaldehyde	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Benzo[a]anthracene	1	1	mg/kg		0.15	0.93	0.34	0.17	0.64	0.079	0.059	0.046	0.72
Benzo[a]pyrene	1	1	mg/kg		0.16	**1.1**	0.32	0.33	0.84	0.1	0.075	0.06	0.84
Benzo[b]fluoranthene	1	1	mg/kg		0.21	**1.3**	0.39	0.75	**1.1**	0.13	0.1	0.085	1
Benzo[g,h,i]perylene	100	100	mg/kg		0.11 J	0.51	0.17 J	0.56	0.49	0.065 J	0.057 J	0.044 J	0.47
Benzo[k]fluoranthene	0.8	3.9	mg/kg		0.085	0.46	0.18	0.26	0.41	0.046	0.041	0.030 J	0.31
Bis(2-chloro-1-methylethyl)ether	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Bis(2-chloroethoxy)methane	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Bis(2-chloroethyl) ether	--	--	mg/kg		0.036 U	0.037 U	0.036 U	0.035 U	0.036 U	0.036 U	0.035 U	0.035 U	0.036 U
Bis(2-ethylhexyl) phthalate	--	--	mg/kg		0.053 J	0.098 J	0.36 U	0.35 U	0.070 J	0.068 J	0.15 J	0.090 J	0.36 U

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-25	RX-25	RX-30	RX-30	RX-31	RX-31	RX-32	RX-32 DUP	RX-32
				Sample Date:	01/12/2021	01/12/2021	2/11/2021	2/11/2021	2/11/2021	2/11/2021	2/10/2021	2/10/2021	2/10/2021
				Sample Depth (ft bls):	0 - 2	5 - 7	0.5 - 2.5	2.5 - 4.5	0.5 - 2.5	5 - 7	0.5 - 2.5	0.5 - 2.5	4 - 6
Butylbenzyl phthalate	--	--	mg/kg		0.36 U	0.37 U	0.064 J	0.35 U	0.26 J	0.16 J	0.83	0.79	0.36 U
Caprolactam	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Carbazole	--	--	mg/kg		0.36 U	0.092 J	0.046 J	0.35 U	0.027 J	0.36 U	0.35 U	0.35 U	0.080 J
Chrysene	1	3.9	mg/kg		0.15 J	0.81	0.30 J	0.28 J	0.72	0.073 J	0.067 J	0.054 J	0.69
Dibenzo[a,h]anthracene	0.33	0.33	mg/kg		0.036 U	0.14	0.05	0.16	0.13	0.036 U	0.017 J	0.035 U	0.13
Dibenzofuran	7	59	mg/kg		0.36 U	0.05 J	0.049 J	0.35 U	0.014 J	0.36 U	0.35 U	0.35 U	0.042 J
Diethyl phthalate	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Dimethyl phthalate	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Di-n-butyl phthalate	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Di-n-octyl phthalate	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Fluoranthene	100	100	mg/kg		0.23 J	1.6	0.67	0.20 J	0.94	0.11 J	0.082 J	0.063 J	1.3
Fluorene	30	100	mg/kg		0.36 U	0.09 J	0.061 J	0.35 U	0.023 J	0.036 J	0.35 U	0.35 U	0.067 J
Hexachlorobenzene	0.33	1.2	mg/kg		0.036 U	0.037 U	0.036 U	0.035 U	0.036 U	0.036 U	0.035 U	0.035 U	0.036 U
Hexachlorobutadiene	--	--	mg/kg		0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U	0.071 U	0.071 U	0.073 U
Hexachlorocyclopentadiene	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Hexachloroethane	--	--	mg/kg		0.036 U	0.037 U	0.036 U	0.035 U	0.036 U	0.036 U	0.035 U	0.035 U	0.036 U
Indeno[1,2,3-cd]pyrene	0.5	0.5	mg/kg		0.13	**0.56**	0.23	**0.57**	**0.61**	0.076	0.064	0.046	**0.53**
Isophorone	--	--	mg/kg		0.15 U	0.15 U	0.14 U	0.14 U	0.15 U	0.15 U	0.14 U	0.14 U	0.15 U
Naphthalene	12	100	mg/kg		0.36 U	0.046 J	0.086 J	0.35 U	0.037 J	0.061 J	0.013 J	0.012 J	0.032 J
Nitrobenzene	--	--	mg/kg		0.036 U	0.037 U	0.036 U	0.035 U	0.036 U	0.036 U	0.035 U	0.035 U	0.036 U
n-Nitrosodi-n-propylamine	--	--	mg/kg		0.036 U	0.037 U	0.036 U	0.035 U	0.036 U	0.036 U	0.035 U	0.035 U	0.036 U
n-Nitrosodiphenylamine	--	--	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Pentachlorophenol	0.8	6.7	mg/kg		0.29 U	0.3 U	0.29 U	0.28 U	0.29 U	0.29 U	0.28 U	0.28 U	0.29 U
Phenanthrene	100	100	mg/kg		0.11 J	0.93	0.53	0.097 J	0.28 J	0.10 J	0.049 J	0.037 J	0.86
Phenol	0.33	100	mg/kg		0.36 U	0.37 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.35 U	0.36 U
Pyrene	100	100	mg/kg		0.23 J	1.6	0.56	0.19 J	0.85	0.11 J	0.10 J	0.080 J	1.4

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-33	RX-33
				Sample Date:	2/10/2021	2/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	9 - 11
1,1'-Biphenyl	--	--	mg/kg		0.36 U	0.37 U
1,2,4,5-Tetrachlorobenzene	--	--	mg/kg		0.36 U	0.37 U
2,3,4,6-Tetrachlorophenol	--	--	mg/kg		0.36 U	0.37 U
2,4,5-Trichlorophenol	--	--	mg/kg		0.36 U	0.37 U
2,4,6-Trichlorophenol	--	--	mg/kg		0.15 U	0.15 U
2,4-Dichlorophenol	--	--	mg/kg		0.15 U	0.15 U
2,4-Dimethylphenol	--	--	mg/kg		0.36 U	0.37 U
2,4-Dinitrophenol	--	--	mg/kg		0.29 U	0.30 U
2,4-Dinitrotoluene	--	--	mg/kg		0.074 U	0.075 U
2,6-Dinitrotoluene	--	--	mg/kg		0.074 U	0.075 U
2-Chloronaphthalene	--	--	mg/kg		0.36 U	0.37 U
2-Chlorophenol	--	--	mg/kg		0.36 U	0.37 U
2-Methylnaphthalene	--	--	mg/kg		0.065 J	0.37 U
2-Methylphenol	0.33	100	mg/kg		0.36 U	0.37 U
2-Nitroaniline	--	--	mg/kg		0.36 U	0.37 U
2-Nitrophenol	--	--	mg/kg		0.36 U	0.37 U
3&4-Methylphenol	0.33	100	mg/kg		0.36 U	0.37 U
3,3'-Dichlorobenzidine	--	--	mg/kg		0.15 U	0.15 U
3-Nitroaniline	--	--	mg/kg		0.36 U	0.37 U
4,6-Dinitro-2-methylphenol	--	--	mg/kg		0.29 U	0.30 U
4-Bromophenyl phenyl ether	--	--	mg/kg		0.36 U	0.37 U
4-Chloro-3-methylphenol	--	--	mg/kg		0.36 U	0.37 U
4-Chloroaniline	--	--	mg/kg		0.36 U	0.37 U
4-Chlorophenyl phenyl ether	--	--	mg/kg		0.36 U	0.37 U
4-Methylphenol	0.33	100	mg/kg		0.36 U	0.37 U
4-Nitroaniline	--	--	mg/kg		0.36 U	0.37 U
4-Nitrophenol	--	--	mg/kg		0.12 J	0.75 U
Acenaphthene	20	100	mg/kg		0.023 J	0.021 J
Acenaphthylene	100	100	mg/kg		0.12 J	0.37 U
Acetophenone	--	--	mg/kg		0.36 U	0.37 U
Anthracene	100	100	mg/kg		0.16 J	0.050 J
Atrazine	--	--	mg/kg		0.15 U	0.15 U
Benzaldehyde	--	--	mg/kg		0.36 U	0.37 U
Benzo[a]anthracene	1	1	mg/kg		**1.1**	0.15
Benzo[a]pyrene	1	1	mg/kg		**1.1**	0.16
Benzo[b]fluoranthene	1	1	mg/kg		**1.4**	0.19
Benzo[g,h,i]perylene	100	100	mg/kg		0.56	0.094 J
Benzo[k]fluoranthene	0.8	3.9	mg/kg		0.48	0.075
Bis(2-chloro-1-methylethyl)ether	--	--	mg/kg		0.36 U	0.37 U
Bis(2-chloroethoxy)methane	--	--	mg/kg		0.36 U	0.37 U
Bis(2-chloroethyl) ether	--	--	mg/kg		0.036 U	0.037 U
Bis(2-ethylhexyl) phthalate	--	--	mg/kg		0.083 J	0.028 J

Table 2. Summary of Semivolatile Organic Compounds in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-33	RX-33
				Sample Date:	2/10/2021	2/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	9 - 11
Butylbenzyl phthalate	--	--	mg/kg		0.63	0.37 U
Caprolactam	--	--	mg/kg		0.36 U	0.37 U
Carbazole	--	--	mg/kg		0.051 J	0.020 J
Chrysene	1	3.9	mg/kg		1	0.13 J
Dibenzo[a,h]anthracene	0.33	0.33	mg/kg		0.19	0.026 J
Dibenzofuran	7	59	mg/kg		0.031 J	0.015 J
Diethyl phthalate	--	--	mg/kg		0.36 U	0.37 U
Dimethyl phthalate	--	--	mg/kg		0.36 U	0.37 U
Di-n-butyl phthalate	--	--	mg/kg		0.019 J	0.37 U
Di-n-octyl phthalate	--	--	mg/kg		0.36 U	0.37 U
Fluoranthene	100	100	mg/kg		1.7	0.27 J
Fluorene	30	100	mg/kg		0.059 J	0.020 J
Hexachlorobenzene	0.33	1.2	mg/kg		0.036 U	0.037 U
Hexachlorobutadiene	--	--	mg/kg		0.074 U	0.075 U
Hexachlorocyclopentadiene	--	--	mg/kg		0.36 U	0.37 U
Hexachloroethane	--	--	mg/kg		0.036 U	0.037 U
Indeno[1,2,3-cd]pyrene	0.5	0.5	mg/kg		**0.64**	0.1
Isophorone	--	--	mg/kg		0.15 U	0.15 U
Naphthalene	12	100	mg/kg		0.14 J	0.025 J
Nitrobenzene	--	--	mg/kg		0.036 U	0.037 U
n-Nitrosodi-n-propylamine	--	--	mg/kg		0.036 U	0.037 U
n-Nitrosodiphenylamine	--	--	mg/kg		0.36 U	0.37 U
Pentachlorophenol	0.8	6.7	mg/kg		0.29 U	0.30 U
Phenanthrene	100	100	mg/kg		1.1	0.19 J
Phenol	0.33	100	mg/kg		0.36 U	0.37 U
Pyrene	100	100	mg/kg		2.1	0.27 J

Table 3. Summary of Metals in Soil, 430 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	MR-4	MR-4	MR-7	MR-12	MR-14	MR-14	RX-4	RX-4	RX-6
				Sample Date:	7/24/2018	7/24/2018	8/2/2018	7/24/2018	7/30/2018	7/30/2018	9/28/2018	9/28/2018	9/28/2018
				Sample Depth (ft bls):	1 - 1.5	9.5 - 11	0.5 - 2.5	1.25 - 3	1 - 1.5	5 - 6	0.5 - 2.5	9.5 - 11.5	0.5 - 2.5
Aluminum	--	--	mg/kg		7150	8560	11300	10400	11700	12700	9650	11500	7270
Antimony	--	--	mg/kg		0.81 J	1.1 U	0.83 U	0.87 U	0.92 U	0.83 U	8.1	0.98 U	0.35 J
Arsenic	13	16	mg/kg		5.3	2.3	3.4	2.6	3.7	5.4	**13.1**	2.2	3.8
Barium	350	400	mg/kg		111	48.6	75.7	65.4	57.1	122	**967**	36.7	105
Beryllium	7.2	72	mg/kg		0.27 J	0.33 J	0.64	0.34 J	0.56	0.65	0.29 J	0.51	0.29 J
Cadmium	2.5	4.3	mg/kg		1	1.1 U	0.29 J	0.87 U	0.92 U	1.6	**21**	0.98 U	1.4
Calcium	--	--	mg/kg		70600	30300	57100	59100	10800	13900	15400	112000	14900
Chromium	30	180	mg/kg		15.6	15.3	23.4	23.6	20.6	24.1	**42.8**	15	15.3
Cobalt	--	--	mg/kg		5.3	5.8	7.2	11.3	7.2	7.5	10.4	5.8	4.9
Copper	50	270	mg/kg		37.2	18.3	21.3	31.4	20.3	35.6	**520**	10.6	**72.5**
Cyanide	27	27	mg/kg		0.14 J	0.082 J	0.14 BJ	0.29 U	0.081 J	0.11 J	NA	NA	NA
Iron	--	--	mg/kg		12100	14200	16600	18700	16900	20800	41100	14500	12200
Lead	63	400	mg/kg		**141**	33.6	**82.4**	23.1	29.9	**162**	**1790**	13.1	**345**
Magnesium	--	--	mg/kg		39600	18700	34200	29900	9620	6490	9160	63300	10400
Manganese	1600	2000	mg/kg		237	351	319	455	406	537	411	240	221
Mercury	0.18	0.81	mg/kg		0.12	0.019 U	0.06	0.024	0.17	0.099	**0.5**	0.014 J	0.056
Nickel	30	310	mg/kg		16.5	13.3	16.1	18.7	16.1	18.2	**164**	11	13
Potassium	--	--	mg/kg		2380	1620	2810	2580	1370	1560	1730	6720	1590
Selenium	3.9	180	mg/kg		5.1 U	5.3 U	4.2 U	4.3 U	0.33 J	0.44 J	1.6 J	4.9 U	5.9 U
Silver	2	180	mg/kg		1 U	1.1 U	0.83 U	0.87 U	0.92 U	**39.5**	1.0 J	0.98 U	1.8
Sodium	--	--	mg/kg		427	436	354	364	793	731	521	961	367
Thallium	--	--	mg/kg		0.15 J	0.42 U	0.15 J	0.13 J	0.13 J	0.15 J	0.19 J	0.13 J	0.47 U
Vanadium	--	--	mg/kg		29.2	17.6	30.8	24.5	23.3	29.3	46.1	19.1	30.8
Zinc	109	10000	mg/kg		**274**	**178**	**175**	61.6	63.6	**366**	**19200**	92.3	**298**

Table 3. Summary of Metals in Soil, 430 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-6	RX-7	RX-9	RX-10	RX-12	RX-15	RX-16	RX-17
				Sample Date:	9/28/2018	9/28/2018	10/1/2018	10/1/2018	10/1/2018	01/13/2021	01/13/2021	01/13/2021
				Sample Depth (ft bls):	9 - 11	0.5 - 2.5	1.0 - 2.5	1 - 3	2.5 - 4.0	2 - 4	1.5 - 3.5	2 - 4
Aluminum	--	--	mg/kg		8270	11900	8540	8870	8360	6890	7160	9180
Antimony	--	--	mg/kg		1.1 U	0.46 J	1.1 U	1 U	0.97 U	0.9 U	0.91 U	0.98 U
Arsenic	13	16	mg/kg		1.3	4.4	2.4	2.1	3.6	1.8	2.4	2.3
Barium	350	400	mg/kg		31.6	184	37.1	50.9	78.7	38.1	52.7	46.1
Beryllium	7.2	72	mg/kg		0.37 J	0.53	0.43	0.47	0.35 J	0.33 J	0.29 J	0.47
Cadmium	2.5	4.3	mg/kg		1.1 U	0.76 J	1.1 U	1 U	1.9	0.1 J	0.23 J	0.12 J
Calcium	--	--	mg/kg		39400	30100	53900	50200	69400	34800	129000	28600
Chromium	30	180	mg/kg		13.5	29.8	14.4	15.7	14.4	13.2	9.9	13.3
Cobalt	--	--	mg/kg		5.6	8.4	5.9	20.2	5.8	4.7	3	5.1
Copper	50	270	mg/kg		12.7	37.6	13.5	14.2	28.4	11.2	15.1	10.2
Cyanide	27	27	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	--	mg/kg		13000	18300	14200	13700	11600	11200	8220	12400
Lead	63	400	mg/kg		8	**196**	15.8	24.9	**94.7**	16.1	58.3	17.2
Magnesium	--	--	mg/kg		24700	18000	31600	27900	36600	18500	70800	17600
Manganese	1600	2000	mg/kg		185	326	250	293	250	258	197	257
Mercury	0.18	0.81	mg/kg		0.019 U	**0.24**	0.018 U	0.019	**0.25**	0.023	0.033	0.029
Nickel	30	310	mg/kg		13.1	22.7	14.5	15.1	14	10.4	7.7	11.6
Potassium	--	--	mg/kg		2490	2410	1910	2630	2430	1370	3980	1560
Selenium	3.9	180	mg/kg		5.4 U	5.6 U	5.4 U	5 U	4.8 U	1.1 U	0.12 J	0.12 J
Silver	2	180	mg/kg		1.1 U	1.1 U	1.1 U	1 U	1	0.9 U	0.91 U	0.98 U
Sodium	--	--	mg/kg		432	1280	218	558	452	280	317	178
Thallium	--	--	mg/kg		0.43 U	0.21 J	0.43 U	0.4 U	0.13 J	0.075 J	0.088 J	0.1 J
Vanadium	--	--	mg/kg		15.7	32.1	16.7	19.7	20	13.8	13.5	15.6
Zinc	109	10000	mg/kg		35.3	**372**	70.4	72.7	**206**	43.2	98.7	63.1

Table 3. Summary of Metals in Soil, 430 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-18	RX-18	RX-19	RX-19	RX-20	RX-20	RX-21	RX-21 DUP
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021
				Sample Depth (ft bls):	2 - 4	6 - 8	0 - 2	6 - 8	2 - 4	5 - 7	0 - 2	0 - 2
Aluminum	--	--	mg/kg		8180	5860	7520	3580	6340	7970	5870	5020
Antimony	--	--	mg/kg		2.1	0.86 U	0.13 J	0.84 U	0.75 J	0.12 J	0.59 J	0.47 J
Arsenic	13	16	mg/kg		4.3	1.6	2.3	2.7	4.1	4.3	5.1	4.7
Barium	350	400	mg/kg		166	**405**	76.8	139	154	299	142	116
Beryllium	7.2	72	mg/kg		0.28 J	0.25 J	0.3 J	0.15 J	0.28 J	0.27 J	0.32 J	0.27 J
Cadmium	2.5	4.3	mg/kg		**3.4**	0.66 J	0.43 J	**94.1**	2.3	0.32 J	1.4	1.2
Calcium	--	--	mg/kg		50100	69100	65700	20100	65000	56000	48500	65300
Chromium	30	180	mg/kg		21.5	18.1	17	9.9	22.7	**37.3**	13.1	12.1
Cobalt	--	--	mg/kg		8.4	2.7	5.4	2.4	5.3	5.1	4.6	4.2
Copper	50	270	mg/kg		**64.9**	14.4	23.3	22.8	**153**	20.9	**52.5**	**51.2**
Cyanide	27	27	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	--	mg/kg		19400	10800	13100	17800	14400	19100	12100	11300
Lead	63	400	mg/kg		**406**	**497**	55.3	**87.8**	**170**	**129**	**206**	**159**
Magnesium	--	--	mg/kg		27000	21200	35700	7320	33200	8120	21700	30700
Manganese	1600	2000	mg/kg		607	133	222	174	197	214	197	177
Mercury	0.18	0.81	mg/kg		0.11	0.1	0.048	0.041	0.097	0.016 J	**0.5**	**0.37**
Nickel	30	310	mg/kg		26.2	6.9	15.1	7.6	29.7	15.8	15.3	13.3
Potassium	--	--	mg/kg		3450	1620	1920	514	1780	1320	1200	1110
Selenium	3.9	180	mg/kg		0.4 J	0.12 J	0.12 J	1 U	0.25 J	0.62 J	0.36 J	0.3 J
Silver	2	180	mg/kg		0.47 J	0.86 U	0.85 J	0.081 J	1.1	0.081 J	0.91	0.96
Sodium	--	--	mg/kg		514	1440	438	231	359	591	450	361
Thallium	--	--	mg/kg		0.22 J	0.046 J	0.1 J	0.041 J	0.12 J	0.091 J	0.12 J	0.12 J
Vanadium	--	--	mg/kg		29.4	14.5	22.6	15.4	35.5	22.1	63.5	40
Zinc	109	10000	mg/kg		**818**	**351**	**163**	**176**	**722**	**310**	**281**	**241**

Table 3. Summary of Metals in Soil, 430 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-21	RX-22	RX-22	RX-23	RX-23	RX-24	RX-24	RX-25
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021
				Sample Depth (ft bls):	5 - 7	0 - 2	2 - 4	0 - 2	3 - 5	0 - 2	5 - 7	0 - 2
Aluminum	--	--	mg/kg		8530	5240	9830	9800	5800	4280	10200	8410
Antimony	--	--	mg/kg		0.13 J	0.17 J	0.91 U	0.84 U	0.57 J	0.27 J	0.94 U	0.15 J
Arsenic	13	16	mg/kg		2.5	3.7	2.8	2.9	3.9	2.6	3.5	2.4
Barium	350	400	mg/kg		43.4	73.3	52.7	53	121	87.3	70.7	66.5
Beryllium	7.2	72	mg/kg		0.37	0.28 J	0.43	0.45	0.29 J	0.17 J	0.39	0.35
Cadmium	2.5	4.3	mg/kg		0.16 J	0.83 J	0.15 J	0.12 J	**4**	0.67 J	0.15 J	0.42 J
Calcium	--	--	mg/kg		27400	65600	7710	7680	20300	106000	21000	47900
Chromium	30	180	mg/kg		13.4	10.7	18.9	16.5	12.7	8.5	18.1	14.9
Cobalt	--	--	mg/kg		5.1	4	7.4	5.6	5.3	3.2	6	5
Copper	50	270	mg/kg		12.4	34.9	20.5	16.9	**85**	39.4	21.6	18.6
Cyanide	27	27	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	--	mg/kg		12700	9940	15800	14200	11600	9550	15400	12700
Lead	63	400	mg/kg		26.2	**174**	22.9	20.8	**200**	**83.8**	44.5	**64.2**
Magnesium	--	--	mg/kg		14200	31000	9810	9420	12300	62700	14800	23300
Manganese	1600	2000	mg/kg		219	197	402	266	224	167	275	245
Mercury	0.18	0.81	mg/kg		0.025	0.18	0.0078 J	0.03	**0.6**	0.11	0.065	0.068
Nickel	30	310	mg/kg		11	13.7	16.3	12.8	17.8	11	14.8	13.5
Potassium	--	--	mg/kg		1120	1060	1230	1080	812	1530	2690	1750
Selenium	3.9	180	mg/kg		0.14 J	0.21 J	1.1 U	0.19 J	0.17 J	0.19 J	0.27 J	0.2 J
Silver	2	180	mg/kg		0.91 U	0.85 J	0.14 J	0.84 U	1	0.24 J	0.94 U	0.075 J
Sodium	--	--	mg/kg		489	264	641	471	175	240	747	826
Thallium	--	--	mg/kg		0.099 J	0.063 J	0.093 J	0.11 J	0.089 J	0.076 J	0.13 J	0.09 J
Vanadium	--	--	mg/kg		17.2	22.9	22.2	19.8	28.1	22.1	24.3	20.4
Zinc	109	10000	mg/kg		72.3	**194**	51.6	58	**412**	107	62.4	105

Table 3. Summary of Metals in Soil, 430 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-25	RX-30	RX-30	RX-31	RX-31	RX-32	RX-32 DUP	RX-32	RX-33
				Sample Date:	01/12/2021	2/11/2021	2/11/2021	2/11/2021	2/11/2021	2/10/2021	2/10/2021	2/10/2021	2/10/2021
				Sample Depth (ft bls):	5 - 7	0.5 - 2.5	2.5 - 4.5	0.5 - 2.5	5 - 7	0.5 - 2.5	0.5 - 2.5	4 - 6	0.5 - 2.5
Aluminum	--	--	mg/kg		8420	4790	6070	12600	7530	7390	6750	7770	15400
Antimony	--	--	mg/kg		0.87 U	1.1 U	1.0 U	0.38 J	1.1 U	0.84 U	0.80 U	0.12 J	0.88 U
Arsenic	13	16	mg/kg		3.6	8.4	2.1	5.9	1.7	1.2	1.2	2.7	3.3
Barium	350	400	mg/kg		86.8	48	34.1	170	56.2	56.7	50.8	279	232
Beryllium	7.2	72	mg/kg		0.33 J	0.25 J	0.31 J	0.42 J	0.33 J	0.27 J	0.24 J	0.26 J	0.42
Cadmium	2.5	4.3	mg/kg		0.29 J	0.13 J	1.0 U	0.38 J	0.12 J	0.10 J	0.11 J	0.41 J	0.92
Calcium	--	--	mg/kg		15400	249000	7450	14000	73500	129000	132000	75800	13300
Chromium	30	180	mg/kg		16.7	12.9	10.5	**35.7**	12.1	16.5	17	19.3	**52.3**
Cobalt	--	--	mg/kg		5.3	4.3	5.8	11.4	4.7	7.2	5.2	3	11.4
Copper	50	270	mg/kg		19.2	12.6	12.3	**63.6**	12.8	15	13	19.4	36.1
Cyanide	27	27	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	--	mg/kg		12700	13700	11700	32600	10400	10200	9340	10400	23700
Lead	63	400	mg/kg		**65.5**	24.6	6.6	**88.4**	30.7	21.5	23.2	**346**	**87.5**
Magnesium	--	--	mg/kg		11300	55400	7000	10200	43100	78100	78400	16200	12400
Manganese	1600	2000	mg/kg		233	325	423	488	280	220	204	174	389
Mercury	0.18	0.81	mg/kg		0.07	0.084	0.084	0.17	0.021	0.031	0.032	0.11	0.13
Nickel	30	310	mg/kg		12.9	10.9	13.6	29.9	11	13	11.9	9.8	**31.2**
Potassium	--	--	mg/kg		1200	1720	1430	3660	2180	3050	2550	1420	5380
Selenium	3.9	180	mg/kg		0.2 J	1.3 U	1.3 U	0.24 J	1.4 U	1.0 U	1.0 U	1.1 U	0.23 J
Silver	2	180	mg/kg		0.87 U	1.1 U	1.0 U	0.15 J	1.1 U	0.84 U	0.80 U	0.86 U	0.11 J
Sodium	--	--	mg/kg		807	317	107	257	235	184	180	319	218
Thallium	--	--	mg/kg		0.097 J	0.097 J	0.088 J	0.24 J	0.087 J	0.12 J	0.093 J	0.045 J	0.34 J
Vanadium	--	--	mg/kg		19.2	16.9	13	40.3	15.3	16.4	16	15.3	48.4
Zinc	109	10000	mg/kg		**140**	62.6	34.2	**139**	56.8	54.4	50.7	**323**	**273**

Table 3. Summary of Metals in Soil, 430 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-33
				Sample Date:	2/10/2021
				Sample Depth (ft bls):	9 - 11
Aluminum	--	--	mg/kg		8310
Antimony	--	--	mg/kg		0.12 J
Arsenic	13	16	mg/kg		2.2
Barium	350	400	mg/kg		74.2
Beryllium	7.2	72	mg/kg		0.35
Cadmium	2.5	4.3	mg/kg		0.29 J
Calcium	--	--	mg/kg		34700
Chromium	30	180	mg/kg		14.7
Cobalt	--	--	mg/kg		5.1
Copper	50	270	mg/kg		15.1
Cyanide	27	27	mg/kg		NA
Iron	--	--	mg/kg		12200
Lead	63	400	mg/kg		**87.8**
Magnesium	--	--	mg/kg		21000
Manganese	1600	2000	mg/kg		262
Mercury	0.18	0.81	mg/kg		0.058
Nickel	30	310	mg/kg		12.1
Potassium	--	--	mg/kg		1790
Selenium	3.9	180	mg/kg		0.12 J
Silver	2	180	mg/kg		0.83 U
Sodium	--	--	mg/kg		306
Thallium	--	--	mg/kg		0.088 J
Vanadium	--	--	mg/kg		16.9
Zinc	109	10000	mg/kg		**187**

Table 4. Summary of Polychlorinated Biphenyls in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	MR-4	MR-4	MR-7	MR-12	MR-14	MR-14	RX-9	RX-12	RX-15	RX-16	RX-17
				Sample Date:	7/24/2018	7/24/2018	8/2/2018	7/24/2018	7/30/2018	7/30/2018	10/1/2018	10/1/2018	01/13/2021	01/13/2021	01/13/2021
				Sample Depth (ft bls):	1 - 1.5	9.5 - 11	0.5 - 2.5	1.25 - 3	1 - 1.5	5 - 6	1.0 - 2.5	2.5 - 4.0	2 - 4	1.5 - 3.5	2 - 4
Aroclor-1016	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.08 U
Aroclor-1221	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.08 U
Aroclor-1232	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.08 U
Aroclor-1242	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.08 U
Aroclor-1248	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.08 U
Aroclor-1254	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.049 J
Aroclor-1260	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.08 U
Aroclor-1262	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.08 U
Aroclor-1268	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.08 U
PCBs, Total	0.1	1	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.08 U	0.072 U	0.078 U	0.079 U	0.049 J

Table 4. Summary of Polychlorinated Biphenyls in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-18	RX-18	RX-19	RX-19	RX-20	RX-20	RX-21	RX-21 DUP	RX-21	RX-22
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021
				Sample Depth (ft bls):	2 - 4	6 - 8	0 - 2	6 - 8	2 - 4	5 - 7	0 - 2	0 - 2	5 - 7	0 - 2
Aroclor-1016	--	--	mg/kg		0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.072 U	0.072 U	0.077 U	0.074 U
Aroclor-1221	--	--	mg/kg		0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.072 U	0.072 U	0.077 U	0.074 U
Aroclor-1232	--	--	mg/kg		0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.072 U	0.072 U	0.077 U	0.074 U
Aroclor-1242	--	--	mg/kg		0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.072 U	0.072 U	0.077 U	0.074 U
Aroclor-1248	--	--	mg/kg		0.12	0.071 U	0.073 U	0.072 U	0.17	0.074 U	0.072 U	0.072 U	0.077 U	0.074 U
Aroclor-1254	--	--	mg/kg		0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.072 U	0.072 U	0.077 U	0.074 U
Aroclor-1260	--	--	mg/kg		0.071 J	0.071 U	0.073 U	0.072 U	0.2	0.074 U	0.075	0.08	0.077 U	0.074 U
Aroclor-1262	--	--	mg/kg		0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.072 U	0.072 U	0.077 U	0.074 U
Aroclor-1268	--	--	mg/kg		0.072 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.072 U	0.072 U	0.077 U	0.074 U
PCBs, Total	0.1	1	mg/kg		**0.19**	0.071 U	0.073 U	0.072 U	**0.37**	0.074 U	0.075	0.08	0.077 U	0.074 U

Table 4. Summary of Polychlorinated Biphenyls in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-22	RX-23	RX-23	RX-24	RX-24	RX-25	RX-25	RX-30	RX-30	RX-31	RX-31
				Sample Date:	01/11/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	2/11/2021	2/11/2021	2/11/2021	2/11/2021
				Sample Depth (ft bls):	2 - 4	0 - 2	3 - 5	0 - 2	5 - 7	0 - 2	5 - 7	0.5 - 2.5	2.5 - 4.5	0.5 - 2.5	5 - 7
Aroclor-1016	--	--	mg/kg		0.076 U	0.077 U	0.076 U	0.082 U	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U
Aroclor-1221	--	--	mg/kg		0.076 U	0.077 U	0.076 U	0.082 U	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U
Aroclor-1232	--	--	mg/kg		0.076 U	0.077 U	0.076 U	0.082 U	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U
Aroclor-1242	--	--	mg/kg		0.076 U	0.077 U	0.076 U	0.082 U	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U
Aroclor-1248	--	--	mg/kg		0.076 U	0.077 U	0.076 U	0.082 U	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U
Aroclor-1254	--	--	mg/kg		0.076 U	0.077 U	0.076 U	0.082 U	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U
Aroclor-1260	--	--	mg/kg		0.076 U	0.077 U	0.22	0.085	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U
Aroclor-1262	--	--	mg/kg		0.076 U	0.077 U	0.076 U	0.082 U	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U
Aroclor-1268	--	--	mg/kg		0.076 U	0.077 U	0.076 U	0.082 U	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U
PCBs, Total	0.1	1	mg/kg		0.076 U	0.077 U	**0.22**	0.085	0.074 U	0.074 U	0.074 U	0.072 U	0.071 U	0.073 U	0.073 U

Table 4. Summary of Polychlorinated Biphenyls in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	**Sample Designation:**	RX-32	RX-32 DUP	RX-32	RX-33	RX-33
				Sample Date:	2/10/2021	2/10/2021	2/10/2021	2/10/2021	2/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	0.5 - 2.5	4 - 6	0.5 - 2.5	9 - 11
Aroclor-1016	--	--	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
Aroclor-1221	--	--	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
Aroclor-1232	--	--	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
Aroclor-1242	--	--	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
Aroclor-1248	--	--	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
Aroclor-1254	--	--	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
Aroclor-1260	--	--	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
Aroclor-1262	--	--	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
Aroclor-1268	--	--	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
PCBs, Total	0.1	1	mg/kg		0.071 U	0.071 U	0.073 U	0.073 U	0.075 U

Table 5. Summary of Pesticides and Herbicides in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	MR-4	MR-4	MR-7	MR-12	MR-14	MR-14	RX-15	RX-16	RX-17	RX-18
				Sample Date:	7/24/2018	7/24/2018	8/2/2018	7/24/2018	7/30/2018	7/30/2018	01/13/2021	01/13/2021	01/13/2021	01/11/2021
				Sample Depth (ft bls):	1 - 1.5	9.5 - 11	0.5 - 2.5	1.25 - 3	1 - 1.5	5 - 6	2 - 4	1.5 - 3.5	2 - 4	2 - 4
2,4,5-T	--	--	mg/kg		0.037 U	0.039 U	0.036 U	0.04 U	0.039 U	0.038 U	NA	NA	NA	NA
2,4,5-TP	3.8	100	mg/kg		0.037 U	0.039 U	0.036 U	0.04 U	0.039 U	0.038 U	NA	NA	NA	NA
2,4-D	--	--	mg/kg		0.037 U	0.039 U	0.036 U	0.04 U	0.021 JP	0.038 U	NA	NA	NA	NA
4,4'-DDD	0.0033	13	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0024 J	0.008 U	0.0021 J
4,4'-DDE	0.0033	8.9	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	**0.0034 J**	0.008 U	**0.004 J**
4,4'-DDT	0.0033	7.9	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	**0.0037 JP**
Aldrin	0.005	0.097	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
alpha-BHC	0.02	0.48	mg/kg		0.0022 U	0.0023 U	0.0022 U	0.0024 U	0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0024 U	0.0021 U
alpha-Chlordane	0.094	4.2	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
beta-BHC	0.036	0.36	mg/kg		0.0022 U	0.0023 U	0.0022 U	0.0024 U	0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0024 U	0.0021 U
Chlordane	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
delta-BHC	0.04	100	mg/kg		0.0022 U	0.0023 U	0.0022 U	0.0024 U	0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0024 U	0.0021 U
Dieldrin	0.005	0.2	mg/kg		0.0022 U	0.0023 U	0.0022 U	0.0024 U	0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0024 U	0.0021 U
Endosulfan I	2.4	24	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
Endosulfan II	2.4	24	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
Endosulfan sulfate	2.4	24	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
Endrin aldehyde	--	--	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
Endrin ketone	--	--	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
Endrin	0.014	11	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
gamma-BHC (Lindane)	0.1	1.3	mg/kg		0.0022 U	0.0023 U	0.0022 U	0.0024 U	0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0024 U	0.0021 U
gamma-Chlordane	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	--	--	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
Heptachlor	0.042	2.1	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
Methoxychlor	--	--	mg/kg		0.0073 U	0.0078 U	0.0073 U	0.008 U	0.0078 U	0.0077 U	0.0078 U	0.0079 U	0.008 U	0.0072 U
Toxaphene	--	--	mg/kg		0.073 U	0.078 U	0.073 U	0.08 U	0.078 U	0.077 U	0.078 U	0.079 U	0.08 U	0.072 U

Table 5. Summary of Pesticides and Herbicides in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-18	RX-19	RX-19	RX-20	RX-20	RX-21	RX-21 DUP	RX-21	RX-22
				Sample Date:	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021
				Sample Depth (ft bls):	6 - 8	0 - 2	6 - 8	2 - 4	5 - 7	0 - 2	0 - 2	5 - 7	0 - 2
2,4,5-T	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP	3.8	100	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	0.0033	13	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0021 JP	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
4,4'-DDE	0.0033	8.9	mg/kg		**0.0042 J**	0.0073 U	**0.041**	0.0019 JP	**0.0037 J**	**0.0078**	**0.0079**	0.0077 U	0.0027 J
4,4'-DDT	0.0033	7.9	mg/kg		0.0071 U	0.0073 U	**0.014**	0.0073 U	0.0074 U	**0.0066 JP**	**0.012**	0.0077 U	0.0021 JP
Aldrin	0.005	0.097	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
alpha-BHC	0.02	0.48	mg/kg		0.0021 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U
alpha-Chlordane	0.094	4.2	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
beta-BHC	0.036	0.36	mg/kg		0.0021 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U
Chlordane	--	--	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
delta-BHC	0.04	100	mg/kg		0.0021 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U
Dieldrin	0.005	0.2	mg/kg		0.0021 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U
Endosulfan I	2.4	24	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
Endosulfan II	2.4	24	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
Endosulfan sulfate	2.4	24	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
Endrin aldehyde	--	--	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
Endrin ketone	--	--	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
Endrin	0.014	11	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
gamma-BHC (Lindane)	0.1	1.3	mg/kg		0.0021 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U
gamma-Chlordane	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	--	--	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
Heptachlor	0.042	2.1	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
Methoxychlor	--	--	mg/kg		0.0071 U	0.0073 U	0.0072 U	0.0073 U	0.0074 U	0.0072 U	0.0072 U	0.0077 U	0.0074 U
Toxaphene	--	--	mg/kg		0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.072 U	0.072 U	0.077 U	0.074 U

Table 5. Summary of Pesticides and Herbicides in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-22	RX-23	RX-23	RX-24	RX-24	RX-25	RX-25	RX-30	RX-30
				Sample Date:	01/11/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	2/11/2021	2/11/2021
				Sample Depth (ft bls):	2 - 4	0 - 2	3 - 5	0 - 2	5 - 7	0 - 2	5 - 7	0.5 - 2.5	2.5 - 4.5
2,4,5-T	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP	3.8	100	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	0.0033	13	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
4,4'-DDE	0.0033	8.9	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
4,4'-DDT	0.0033	7.9	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0028 JP	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
Aldrin	0.005	0.097	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
alpha-BHC	0.02	0.48	mg/kg		0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0022 U	0.0022 U	2.2E-07 U	0.0022 U	0.0021 U
alpha-Chlordane	0.094	4.2	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
beta-BHC	0.036	0.36	mg/kg		0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0022 U	0.0022 U	2.2E-07 U	0.0022 U	0.0021 U
Chlordane	--	--	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.072 U	0.071 U
delta-BHC	0.04	100	mg/kg		0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0022 U	0.0022 U	2.2E-07 U	0.0022 U	0.0021 U
Dieldrin	0.005	0.2	mg/kg		0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0022 U	0.0022 U	2.2E-07 U	0.0022 U	0.0021 U
Endosulfan I	2.4	24	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
Endosulfan II	2.4	24	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
Endosulfan sulfate	2.4	24	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
Endrin aldehyde	--	--	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
Endrin ketone	--	--	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
Endrin	0.014	11	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
gamma-BHC (Lindane)	0.1	1.3	mg/kg		0.0023 U	0.0023 U	0.0023 U	0.0024 U	0.0022 U	0.0022 U	2.2E-07 U	0.0022 U	0.0021 U
gamma-Chlordane	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	0.0072 U	0.0071 U
Heptachlor epoxide	--	--	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
Heptachlor	0.042	2.1	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
Methoxychlor	--	--	mg/kg		0.0076 U	0.0077 U	0.0076 U	0.0082 U	0.0074 U	0.0074 U	7.4E-07 U	0.0072 U	0.0071 U
Toxaphene	--	--	mg/kg		0.076 U	0.077 U	0.076 U	0.082 U	0.074 U	0.074 U	7.4E-06 U	0.072 U	0.071 U

Table 5. Summary of Pesticides and Herbicides in Soil, 430 West 207th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCO	NYSDEC Part 376 RRSCO	Units	Sample Designation:	RX-31	RX-31	RX-32	RX-32 DUP	RX-32	RX-33	RX-33
				Sample Date:	2/11/2021	2/11/2021	2/10/2021	2/10/2021	2/10/2021	2/10/2021	2/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	5 - 7	0.5 - 2.5	0.5 - 2.5	4 - 6	0.5 - 2.5	9 - 11
2,4,5-T	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA
2,4,5-TP	3.8	100	mg/kg		NA	NA	NA	NA	NA	NA	NA
2,4-D	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	0.0033	13	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
4,4'-DDE	0.0033	8.9	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
4,4'-DDT	0.0033	7.9	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Aldrin	0.005	0.097	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
alpha-BHC	0.02	0.48	mg/kg		0.0022 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U
alpha-Chlordane	0.094	4.2	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
beta-BHC	0.036	0.36	mg/kg		0.0022 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U
Chlordane	--	--	mg/kg		0.073 U	0.073 U	0.071 U	0.071 U	0.073 U	0.073 U	0.075 U
delta-BHC	0.04	100	mg/kg		0.0022 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U
Dieldrin	0.005	0.2	mg/kg		0.0022 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U
Endosulfan I	2.4	24	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Endosulfan II	2.4	24	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Endosulfan sulfate	2.4	24	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Endrin aldehyde	--	--	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Endrin ketone	--	--	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Endrin	0.014	11	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
gamma-BHC (Lindane)	0.1	1.3	mg/kg		0.0022 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0022 U	0.0022 U
gamma-Chlordane	--	--	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Heptachlor epoxide	--	--	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Heptachlor	0.042	2.1	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Methoxychlor	--	--	mg/kg		0.0073 U	0.0073 U	0.0071 U	0.0071 U	0.0073 U	0.0073 U	0.0075 U
Toxaphene	--	--	mg/kg		0.073 U	0.073 U	0.071 U	0.071 U	0.073 U	0.073 U	0.075 U

Table 6. Summary of Volatile Organic Compounds in Groundwater, 430 West 207th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:	MR-12	MR-14	RX-4	RX-4 DUP	RX-6
		Sample Date:	8/2/2018	8/2/2018	9/28/2018	9/28/2018	9/28/2018
1,1,1-Trichloroethane	5		1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5		1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1		1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	5		1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5		1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	5		1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	5		1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	--		1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	3		1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	0.6		1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1		1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	3		1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	3		1 U	1 U	1 U	1 U	1 U
1,4-Dioxane	--		50 U	50 U	50 U	50 U	50 U
2-Butanone (MEK)	50		2.6 J	5 U	5 U	2.4 J	5 U
2-Hexanone	50		5 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone (MIBK)	--		5 U	5 U	5 U	5 U	5 U
Acetone	50		15	5 U	12	10	5 U
Benzene	1		**20**	1 U	1 U	1 U	1 U
Bromochloromethane	5		1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50		1 U	0.40 J	1 U	1 U	1 U
Bromoform	50		1 U	1 U	1 U	1 U	1 U
Bromomethane	5		1 U	1 U	1 U	1 U	1 U
Carbon disulfide	60		1 U	1 U	1 U	1 U	1 U
Carbon tetrachloride	5		1 U	1 U	1 U	1 U	1 U
Chlorobenzene	5		1 U	1 U	1 U	1 U	1 U
Chloroethane	5		1 U	1 U	1 U	1 U	1 U
Chloroform	7		2.1	**7.3**	1 U	1 U	1 U
Chloromethane	--		1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	5		1 U	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	5		1 U	1 U	1 U	1 U	1 U
Cyclohexane	--		1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	50		1 U	1 U	1 U	1 U	1 U
Dibromochloropropane	0.04		1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	5		1 U	1 U	1 U	1 U	1 U
Ethylbenzene	5		**6**	1 U	1 U	1 U	1 U
Freon 113	--		1 U	1 U	1 U	1 U	1 U

Table 6. Summary of Volatile Organic Compounds in Groundwater, 430 West 207th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MR-12 8/2/2018	MR-14 8/2/2018	RX-4 9/28/2018	RX-4 DUP 9/28/2018	RX-6 9/28/2018
Isopropylbenzene	5		0.80 J	1 U	1 U	1 U	1 U
m+p-Xylene	5		**36**	1 U	1 U	1 U	1 U
Methyl acetate	--		5 U	5 U	5 U	5 U	5 U
Methylcyclohexane	--		1 U	1 U	1 U	1 U	1 U
Methylene chloride	5		1	0.36 J	1 U	1 U	1 U
MTBE	10		0.99 J	1 U	1 U	1 U	1 U
o-Xylene	5		**29**	1 U	1 U	1 U	1 U
Styrene	5		**14**	1 U	1 U	1 U	1 U
Tetrachloroethene	5		1 U	1 U	1 U	1 U	1 U
Toluene	5		**23**	0.41 J	1 U	1 U	1 U
trans-1,2-Dichloroethene	5		1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	--		1 U	1 U	1 U	1 U	1 U
Trichloroethene	5		1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	5		1 U	1 U	1 U	1 U	1 U
Vinyl chloride	2		1 U	1 U	1 U	1 U	1 U

Table 7. Summary of Semivolatile Organic Compounds in Groundwater, 430 West 207th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:	MR-12	MR-14	RX-4	RX-4 DUP	RX-6
		Sample Date:	8/2/2018	8/2/2018	9/28/2018	9/28/2018	9/28/2018
1,1'-Biphenyl	--		50 U	10 U	10 U	10 U	10 U
1,2,4,5-Tetrachlorobenzene	--		50 U	10 U	10 U	10 U	10 U
2,3,4,6-Tetrachlorophenol	--		50 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	--		50 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	--		50 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	5		50 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	50		50 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	10		100 U	20 U	20 U	20 U	20 U
2,4-Dinitrotoluene	5		10 U	2 U	2 U	2 U	2 U
2,6-Dinitrotoluene	5		10 U	2 U	2 U	2 U	2 U
2-Chloronaphthalene	10		50 U	10 U	10 U	10 U	10 U
2-Chlorophenol	--		50 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	--		32 J	10 U	10 U	10 U	10 U
2-Methylphenol	--		170	10 U	10 U	10 U	10 U
2-Nitroaniline	5		50 U	10 U	10 U	10 U	10 U
2-Nitrophenol	--		50 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5		50 UT	10 UT	10 U	10 U	10 U
3-Nitroaniline	5		50 U	10 U	10 U	10 U	10 U
4,6-Dinitro-2-methylphenol	--		100 U	20 U	20 U	20 U	20 U
4-Bromophenyl phenyl ether	--		50 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	--		50 U	10 U	10 U	10 U	10 U
4-Chloroaniline	5		50 UT	10 UT	10 U	10 U	10 U
4-Chlorophenyl phenyl ether	--		50 U	10 U	10 U	10 U	10 U
4-Methylphenol	--		140	10 U	4.1 J	4.0 J	10 U
4-Nitroaniline	5		50 U	10 U	10 U	10 U	10 U
4-Nitrophenol	--		100 U	20 U	20 UT	20 UT	20 UT
Acenaphthene	20		**21 J**	10 U	10 U	10 U	10 U
Acenaphthylene	20		50 U	10 U	10 U	10 U	10 U
Acetophenone	--		50 U	10 U	10 U	10 U	10 U
Anthracene	50		50 U	10 U	2.8 J	10 U	10 U
Atrazine	--		10 U	2 U	2 U	2 U	2 U
Benzaldehyde	--		50 UT	10 UT	10 U	10 U	10 U
Benzo[a]anthracene	0.002		5 U	1 U	**6.7**	1 U	1 U
Benzo[a]pyrene	0		5 U	1 U	**6.2**	1 U	1 U
Benzo[b]fluoranthene	0.002		10 U	2 U	**8**	2 U	2 U
Benzo[g,h,i]perylene	--		50 U	10 U	3.5 J	10 U	10 U
Benzo[k]fluoranthene	0.002		5 U	1 U	**3.1**	1 U	1 U

Table 7. Summary of Semivolatile Organic Compounds in Groundwater, 430 West 207th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MR-12 8/2/2018	MR-14 8/2/2018	RX-4 9/28/2018	RX-4 DUP 9/28/2018	RX-6 9/28/2018
Bis(2-chloro-1-methylethyl)ether	5		50 U	10 U	10 U	10 U	10 U
Bis(2-chloroethoxy)methane	5		50 U	10 U	10 U	10 U	10 U
Bis(2-chloroethyl) ether	--		5 U	1 U	1 U	1 U	1 U
Bis(2-ethylhexyl) phthalate	5		10 U	2 U	2 U	2 U	2 U
Butylbenzyl phthalate	50		50 U	10 U	10 U	10 U	10 U
Caprolactam	--		50 UT	10 UT	10 U	10 U	10 U
Carbazole	--		13 J	10 U	5.0 J	4.6 J	10 U
Chrysene	0.002		10 U	2 U	**6.3**	2 U	2 U
Dibenzo[a,h]anthracene	--		5 U	1 U	0.74 J	1 U	1 U
Dibenzofuran	--		11 J	10 U	10 U	10 U	10 U
Diethyl phthalate	50		50 U	10 U	10 U	10 U	10 U
Dimethyl phthalate	50		50 U	10 U	10 U	10 U	10 U
Di-n-butyl phthalate	50		50 U	10 U	10 U	10 U	10 U
Di-n-octyl phthalate	--		50 U	10 U	10 U	10 U	10 U
Fluoranthene	50		50 U	10 U	13	1.0 J	10 U
Fluorene	50		13 J	10 U	1.3 J	10 U	10 U
Hexachlorobenzene	0.04		5 U	1 U	1 U	1 U	1 U
Hexachlorobutadiene	0.5		5 U	1 U	1 UT	1 UT	1 UT
Hexachlorocyclopentadiene	5		50 U	10 U	10 UT	10 UT	10 UT
Hexachloroethane	5		10 U	2 U	2 U	2 U	2 U
Indeno[1,2,3-cd]pyrene	0.002		10 U	2 U	**3.7**	2 U	2 U
Isophorone	50		50 U	10 U	10 U	10 U	10 U
Naphthalene	10		**570**	10 U	3.4 J	4.0 J	10 U
Nitrobenzene	0.4		5 U	1 U	1 U	1 U	1 U
n-Nitrosodi-n-propylamine	--		5 U	1 U	1 U	1 U	1 U
n-Nitrosodiphenylamine	50		50 U	10 U	10 U	10 U	10 U
Pentachlorophenol	1		100 U	20 U	20 U	20 U	20 U
Phenanthrene	50		8.7 J	10 U	9.9 J	1.3 J	10 U
Phenol	1		50 U	10 U	**2.3 J**	**2.0 J**	10 U
Pyrene	50		50 U	10 U	13	10 U	10 U

Table 8. Summary of Metals in Groundwater, 430 West 207th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	MR-12	MR-14	RX-4	RX-4 DUP	RX-6
		Sample Date:	8/2/2018	8/2/2018	9/28/2018	9/28/2018	9/28/2018
Aluminum	--		7010	419	972	577	470
Antimony	3		2.1	2.4	**3.8**	3	0.91 J
Arsenic	25		6	2.3	3.5	2.9	2 U
Barium	1000		238	274	240	252	536
Beryllium	3		0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Cadmium	5		2 U	2 U	2 U	2 U	2 U
Calcium	--		106000	264000	122000	111000	185000
Chromium	50		23.5	3.1 J	2.6 J	4 U	4 U
Cobalt	--		13	2.5 J	2.2 J	2.3 J	4 U
Copper	200		140	3.3 J	7.1	5.2	3.3 J
Cyanide	200		41.8 B	7.4 BJ	NA	NA	NA
Iron	300		**12600**	**1250**	**1600**	**1190**	**3570**
Lead	25		5.4	2.9	**67.2**	20.9	9.7
Magnesium	35000		**42800**	**127000**	**40300**	**55900**	**137000**
Manganese	300		**634**	**374**	**679**	**826**	**645**
Mercury	0.7		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100		51.1	6.5	7.1	5.8	3.0 J
Potassium	--		21500	64600	74900	68500	52300
Selenium	10		10 U	1.4 J	10 U	10 U	10 U
Silver	50		22.8	2 U	2 U	2 U	2 U
Sodium	20000		**124000**	**901000**	**1290000**	**1400000**	**1380000**
Thallium	0.5		0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Vanadium	--		11.8	1.8 J	10.1	6.9	2.6 J
Zinc	2000		105	10.3 J	78.5	58	16.8

Table 9. Summary of Polychlorinated Biphenyls in Groundwater, 430 West 207th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MR-12 8/2/2018	MR-14 8/2/2018
Aroclor-1016	--		0.4 U	0.4 U
Aroclor-1221	--		0.4 U	0.4 U
Aroclor-1232	--		0.4 U	0.4 U
Aroclor-1242	--		0.4 U	0.4 U
Aroclor-1248	--		0.4 U	0.4 U
Aroclor-1254	--		0.4 U	0.4 U
Aroclor-1260	--		0.4 U	0.4 U
Aroclor-1262	--		0.4 U	0.4 U
Aroclor-1268	--		0.4 U	0.4 U
PCBs, Total	0.09		0.4 U	0.4 U

Table 10. Summary of Pesticides and Herbicides in Groundwater, 430 West 207th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MR-12 8/2/2018	MR-14 8/2/2018
2,4,5-T	--		1.2 U	1.2 U
2,4,5-TP	0.26		1.2 U	1.2 U
2,4-D	50		1.2 U	1.2 U
4,4'-DDD	0.3		0.02 U	0.02 U
4,4'-DDE	0.2		0.02 U	0.02 U
4,4'-DDT	0.2		0.02 U	0.02 U
Aldrin	0		0.02 U	0.02 U
alpha-BHC	--		0.02 U	0.02 U
beta-BHC	--		0.02 U	0.02 U
Chlordane	0.05		0.5 U	0.5 U
delta-BHC	--		0.02 U	0.02 U
Dieldrin	0.004		0.02 U	0.02 U
Endosulfan I	--		0.02 U	0.02 U
Endosulfan II	--		0.02 U	0.02 U
Endosulfan sulfate	--		0.02 U	0.02 U
Endrin aldehyde	5		0.02 U	0.02 U
Endrin ketone	--		0.02 U	0.02 U
Endrin	0		0.02 U	0.02 U
gamma-BHC (Lindane)	--		0.02 U	0.02 U
Heptachlor epoxide	0.03		0.02 U	0.02 U
Heptachlor	0.04		0.02 U	0.02 U
Methoxychlor	35		0.02 U	0.02 U
Toxaphene	0.06		0.5 U	0.5 U

Table 11. Summary of Volatile Organic Compounds in Soil Vapor, 430 West 207th Street, New York, New York

Parameter (Concentrations in ug/m^3)	Sample Designation: / Sample Date:	V-2 8/2/2018	V-4 8/2/2018
1,1,1-Trichloroethane		19 U	3.3 U
1,1,2,2-Tetrachloroethane		24 U	4.1 U
1,1,2-Trichloroethane		19 U	3.3 U
1,1-Dichloroethane		14 U	2.4 U
1,1-Dichloroethene		2.5 U	0.42 U
1,2,4-Trichlorobenzene		66 U	11 U
1,2,4-Trimethylbenzene		18 U	**4.5**
1,2-Dibromoethane		27 U	4.6 U
1,2-Dichlorobenzene		21 U	3.6 U
1,2-Dichloroethane		14 U	2.4 U
1,2-Dichloroethene (total)		28 U	4.7 U
1,2-Dichloropropane		16 U	2.8 U
1,3,5-Trimethylbenzene		18 U	2.9 U
1,3-Butadiene		7.9 U	**0.71 J**
1,3-Dichlorobenzene		21 U	3.6 U
1,4-Dichlorobenzene		21 U	3.6 U
1,4-Dioxane		320 U	54 U
2-Butanone (MEK)		**21 J**	**4.7**
2-Hexanone		36 U	6.1 U
3-Chloropropene		28 U	4.7 U
4-Ethyltoluene		18 U	2.9 U
4-Methyl-2-pentanone (MIBK)		36 U	6.1 U
Acetone		210 U	**46**
Benzene		**23**	**7**
Benzyl chloride		18 U	3.1 U
Bromodichloromethane		24 U	**93**
Bromoethene		16 U	2.6 U
Bromoform		37 U	6.2 U
Bromomethane		14 U	2.3 U
Butane		**130**	**90**
Carbon disulfide		**18 J**	**42**
Carbon tetrachloride		3.9 U	**0.84**
Chlorobenzene		16 U	**1.4 J**
Chlorodifluoromethane		31 U	**24**
Chloroethane		23 U	3.9 U
Chloroform		**30**	**320**
Chloromethane		18 U	**2.0 J**
cis-1,2-Dichloroethene		2.5 U	0.42 U

Table 11. Summary of Volatile Organic Compounds in Soil Vapor, 430 West 207th Street, New York, New York

Parameter (Concentrations in ug/m^3)	**Sample Designation:**	V-2	V-4
	Sample Date:	8/2/2018	8/2/2018
cis-1,3-Dichloropropene		16 U	2.7 U
Cyclohexane		**29**	**5.7**
Dibromochloromethane		30 U	**8.2**
Dichlorodifluoromethane		44 U	7.4 U
Ethylbenzene		**10 J**	**180**
Freon 113		27 U	4.6 U
Freon 114		25 U	4.2 U
Hexachlorobutadiene		38 U	6.4 U
Isooctane		**2600**	**460**
ISOPROPANOL		220 U	37 U
Isopropylbenzene		**15 J**	**6.8**
m+p-Xylene		**22 J**	**410**
Methyl Methacrylate		36 U	**44**
Methylene chloride		31 U	**2.6 J**
MTBE		13 U	2.2 U
Naphthalene		47 U	7.8 U
n-Butylbenzene		20 U	3.3 U
N-HEPTANE		**100**	2.5 U
n-Hexane		**87**	**12**
n-Propylbenzene		**14 J**	2.9 U
o-Chlorotoluene		18 U	3.1 U
o-Xylene		**8.7 J**	**380**
p-Isopropyltoluene		20 U	**15**
sec-Butylbenzene		20 U	3.3 U
Styrene		15 U	**13**
t-Butyl Alcohol		270 U	45 U
tert-Butylbenzene		20 U	3.3 U
Tetrachloroethene		**47**	**0.75 J**
Tetrahydrofuran		260 U	44 U
Toluene		**1600**	**14**
trans-1,2-Dichloroethene		14 U	2.4 U
trans-1,3-Dichloropropene		16 U	2.7 U
Trichloroethene		3.3 U	**1.2**
Trichlorofluoromethane		20 U	**21**
Vinyl chloride		1.6 U	0.27 U
Xylenes (total)		**30 J**	**790**

FIGURES

1. Site Location Map
2. Soil Sample Locations and Exceedances
3. Groundwater Sample Locations and Exceedances
4. Soil Vapor Sample Locations and Detections
5. Proposed Remedial Investigation Sampling Locations
6. Proposed IRM Activity Locations

QUADRANGLE LOCATION

SOURCE:
USGS; 2016, Central Park, NY-NJ
7.5 Minute Topographic Quadrangle

N

0 2000'

Title:

SITE LOCATION MAP

430 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

INWOOD LOT 9 ASSOCIATES LLC

ROUX

Compiled by: V.S.	Date: 30MAR21
Prepared by: B.H.C.	Scale: AS SHOWN
Project Mgr: V.S.	Project: 2477.0008Y000
File: 2477.0008Y107.01.CDR	

FIGURE 1

\2477\Y0008\Y112\2477.0008Y112.04.CDR

RX-30	2/11/21	2/11/21
Depth (ft bls)	0.5 - 2.5	2.5 - 4.5
VOCs	NE	NE
SVOCs		
Indeno(1,2,3-C,D)Pyrene	NE	**0.57**
Metals	NE	NE
PCBs, Total	ND	ND
Pesticides	ND	ND

RX-7	9/28/18
Depth (ft bls)	0.5 - 2.5
VOCs	NE
SVOCs	NE
Metals	
Lead	**196**
Mercury	**0.24**
Zinc	**372**

RX-18	01/11/2021	01/11/2021
Depth (ft bls)	2 - 4	6 - 8
VOCs		
Acetone	**0.091**	ND
SVOCs	NE	NE
Metals		
Barium	NE	**405**
Cadmium	**3.4**	NE
Copper	**64.9**	NE
Lead	**406**	**497**
Zinc	**818**	**351**
PCBs, Total		
Polychlorinated Biphenyl (PCBs)	**0.19**	ND
Pesticides		
P,P'-DDE	**0.004 J**	**0.0042 J**
P,P'-DDT	**0.0037 JP**	ND

RX-19	01/11/2021	01/11/2021
Depth (ft bls)	0 - 2	6 - 8
VOCs	NE	NE
SVOCs	NE	NE
Metals		
Cadmium	NE	**94.1**
Lead	NE	**87.8**
Zinc	**163**	**176**
PCBs, Total	ND	ND
Pesticides		
P,P'-DDE	ND	**0.041**
P,P'-DDT	ND	**0.014**

RX-20	01/11/2021	01/11/2021
Depth (ft bls)	2 - 4	5 - 7
VOCs	NE	NE
SVOCs		
Benzo(A)Anthracene	**1.4**	**11**
Benzo(A)Pyrene	**1.9**	**13**
Benzo(B)Fluoranthene	**2.3**	**15**
Benzo(K)Fluoranthene	NE	**5.3**
Chrysene	**1.2**	**10**
Dibenz(A,H)Anthracene	NE	**2**
Indeno(1,2,3-C,D)Pyrene	**1**	**8.4**
Metals		
Chromium, Total	NE	**37.3**
Copper	**153**	NE
Lead	**170**	**129**
Zinc	**722**	**310**
PCBs, Total		
Polychlorinated Biphenyl (PCBs)	**0.37**	ND
Pesticides		
P,P'-DDE	NE	**0.0037 J**

MR-4	7/24/18	**7/24/18**
Depth (ft bls)	1 - 1.5	**9.5 - 11**
VOCs		
Acetone	NE	**1.6**
SVOCs	NE	NE
Metals		
Lead	**141**	NE
Zinc	**274**	**178**

RX-4	9/28/18	9/28/18
Depth (ft bls)	0.5 - 2.5	9.5 - 11.5
VOCs		
Benzene	**0.23**	ND
SVOCs	NE	NE
Metals		
Arsenic	**13.1**	NE
Barium	**967**	NE
Cadmium	**21**	ND
Chromium	**42.8**	NE
Copper	**520**	NE
Lead	**1790**	NE
Mercury	**0.5**	NE
Nickel	**164**	NE
Zinc	**19200**	NE

MR-7	8/2/18
Depth (ft bls)	0.5 - 2.5
VOCs	NE
SVOCs	NE
Metals	
Lead	**82.4**
Zinc	**175**

RX-31	2/11/21	2/11/21
Depth (ft bls)	0.5 - 2.5	5 - 7
VOCs	NE	ND
SVOCs		
Benzo(B)Fluoranthene	**1.1**	NE
Indeno(1,2,3-C,D)Pyrene	**0.61**	NE
Metals		
Chromium	**35.7**	NE
Copper	**63.6**	NE
Lead	**88.4**	NE
Zinc	**139**	NE
PCBs, Total	ND	ND
Pesticides	ND	ND

B-104	10/14/11
Depth (ft bls)	8.0-10.0
VOCs	NE
SVOCs	NE
Metals	NE

B-105	10/24/11
Depth (ft bls)	8.0-10.0
VOCs	NE
SVOCs	NE
Metals	
Lead	**70.6**

RX-15	01/13/2021
Depth (ft bls)	2 - 4
VOCs	NE
SVOCs	NE
Metals	NE
PCBs, Total	ND
Pesticides	NE

RX-17	01/13/2021
Depth (ft bls)	2 - 4
VOCs	
Acetone	**0.054**
SVOCs	NE
Metals	NE
PCBs, Total	NE
Pesticides	NE

RX-21	01/11/2021	01/11/2021	01/11/2021
Depth (ft bls)	0 - 2	0 - 2 DUP	5 - 7
VOCs	NE	NE	NE
SVOCs	NE	NE	NE
Metals			
Copper	**52.5**	**51.2**	NE
Lead	**206**	**159**	NE
Mercury	**0.5**	**0.37**	NE
Zinc	**281**	**241**	NE
PCBs, Total	NE	NE	ND
Pesticides			
P,P'-DDE	**0.0078**	**0.0079**	ND
P,P'-DDT	**0.0066 JP**	**0.012**	ND

MR-12	7/24/18	7/24/18
Depth (ft bls)	1.25 - 3	3 - 4
VOCs	NE	NE
SVOCs	NE	NE
Metals	NE	NS
Pesticides	ND	NS

RX-22	01/11/2021	01/11/2021
Depth (ft bls)	0 - 2	2 - 4
VOCs	NE	NE
SVOCs	NE	NE
Metals		
Lead	**174**	NE
Zinc	**194**	NE
PCBs, Total	ND	ND
Pesticides	NE	NE

RX-9	10/1/18
Depth (ft bls)	1.0 - 2.5
VOCs	NE
SVOCs	NE
Metals	NE
Pesticides	NE

RX-10	10/1/18
Depth (ft bls)	1.0 - 3.0
VOCs	NE
SVOCs	NE
Metals	NE

RX-25	01/12/2021	01/12/2021
Depth (ft bls)	0 - 2	5 - 7
VOCs	NE	NE
SVOCs		
Benzo(A)Pyrene	NE	**1.1**
Benzo(B)Fluoranthene	NE	**1.3**
Indeno(1,2,3-C,D)Pyrene	NE	**0.56**
Metals		
Lead	**64.2**	**65.5**
Zinc	NE	**140**
PCBs, Total	ND	ND
Pesticides	NE	NE

RX-16	01/13/2021
Depth (ft bls)	1.5 - 3.5
VOCs	NE
SVOCs	NE
Metals	NE
PCBs, Total	ND
Pesticides	
P,P'-DDE	**0.0034 J**

MR-14	7/30/18	**7/30/18**
Depth (ft bls)	1 - 1.5	**5 - 6**
VOCs	NE	NE
SVOCs	NE	NE
Metals		
Lead	NE	**162**
Silver	ND	**39.5**
Zinc	NE	**366**
Pesticides	NE	ND

RX-33	2/10/21	2/10/21
Depth (ft bls)	0.5 - 2.5	9 - 11
VOCs	ND	NE
SVOCs		
Benzo(A)Anthracene	**1.1**	NE
Benzo(A)Pyrene	**1.1**	NE
Benzo(B)Fluoranthene	**1.4**	NE
Indeno(1,2,3-C,D)Pyrene	**0.64**	NE
Metals		
Chromium	**52.3**	NE
Copper	NE	NE
Lead	**87.5**	**87.8**
Nickel	**31.2**	NE
Zinc	**273**	**187**
PCBs, Total	ND	ND
Pesticides	ND	ND

RX-32	2/10/21	2/10/21 DUP	4 - 6
Depth (ft bls)	0.5 - 2.5	0.5 - 2.5	NE
VOCs	NE	NE	NE
SVOCs			
Indeno(1,2,3-C,D)Pyrene	NE	NE	**0.53**
Metals			
Lead	NE	NE	**346**
Zinc	NE	NE	**323**
PCBs, Total	ND	ND	ND
Pesticides	ND	ND	ND

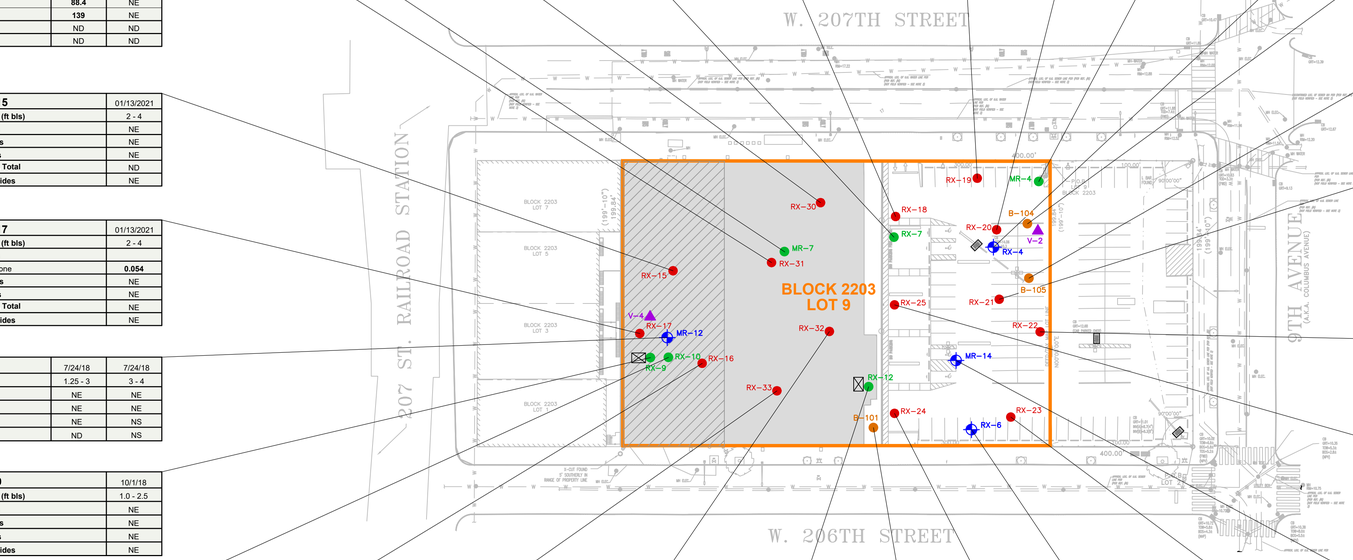
RX-12	10/1/18
Depth (ft bls)	2.5 - 4.0
VOCs	NE
SVOCs	NE
Metals	
Lead	**94.7**
Mercury	**0.25**
Zinc	**206**
Pesticides	NE

B-101	7/9/11
Depth (ft bls)	4.8-6.1
VOCs	NE
SVOCs	ND
Metals	NE

RX-24	01/12/2021	01/12/2021
Depth (ft bls)	0 - 2	5 - 7
VOCs	NE	NE
SVOCs	NE	NE
Metals		
Lead	**83.8**	NE
PCBs, Total	NE	ND
Pesticides	NE	NE

RX-6	9/28/18	9/28/18	9/28/18
Depth (ft bls)	0.5 - 2.5	9 - 11	14 - 16
VOCs	NE	NE	NE
SVOCs	NE	NE	NE
Metals			
Copper	**72.5**	NE	NS
Lead	**345**	NE	NS
Zinc	**298**	NE	NS

RX-23	01/12/2021	01/12/2021
Depth (ft bls)	0 - 2	3 - 5
VOCs	NE	NE
SVOCs	NE	NE
Metals		
Cadmium	NE	**4**
Copper	NE	**85**
Lead	NE	**200**
Mercury	NE	**0.6**
Zinc	NE	**412**
PCBs, Total		
Polychlorinated Biphenyl (PCBs)	ND	**0.22**
Pesticides	NE	NE



LEGEND

- MR-12 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION
- RX-7 — SOIL BORING LOCATION AND DESIGNATION
- B-101 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY STANTEC, 2011)
- RX-18 — SOIL BORING LOCATION AND DESIGNATION (INSTALLED BY ROUX, 2021)
- V-4 — SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- CATCH BASIN
- SITE
- GROCERY STORE FOOTPRINT
- GROCERY STORE BASEMENT
- ELEVATOR

TYPICAL DATA BOX INFORMATION

SAMPLE ID#	RX-10	10/1/18	SAMPLE DATE
	Depth (ft bls)	1.0 - 3.0	SAMPLE DEPTH (FT)
ANALYTES	VOCs	NE	CONCENTRATION (mg/kg)
	SVOCs	NE	
	Metals	NE	

Parameter (Concentrations in mg/kg)	NYSDEC Part 375 UUSCOs (mg/kg)	NYSDEC Part 375 RRSCOs (mg/kg)
VOCs		
Acetone	**0.05**	**NE**
Benzene	**0.06**	**NE**
Ethylbenzene	**1**	**NE**
SVOCs		
Benzo(A)Anthracene	**1**	**1**
Benzo(A)Pyrene	**1**	**1**
Benzo(B)Fluoranthene	**1**	**1**
Benzo(K)Fluoranthene	**0.8**	**3.9**
Chrysene	**1**	**3.9**
Dibenz(A,H)Anthracene	**0.33**	**0.33**
Indeno(1,2,3-C,D)Pyrene	**0.5**	**0.5**
Metals		
Arsenic	**13**	**16**
Barium	**350**	**400**
Cadmium	**2.5**	**4.3**
Chromium	**30**	**180**
Copper	**50**	**270**
Lead	**63**	**400**
Mercury	**0.18**	**0.81**
Nickel	**30**	**310**
Silver	**2**	**180**
Zinc	**109**	**10000**
PCBs, Total		
Polychlorinated Biphenyl (PCBs)	**0.1**	**NE**
Pesticides		
P,P'-DDE	**0.0033**	**NE**
P,P'-DDT	**0.0033**	**NE**

CONCENTRATIONS IN mg/kg

mg/kg – MILLIGRAMS PER KILOGRAM
UUSCOs – NYSDEC PART 375 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES
RRSCOs – NYSDEC PART 375 RESTRICTED RESIDENTIAL SOIL CLEANUP OBJECTIVES
NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DUP – DUPLICATE SAMPLE
PCBs – POLYCHLORINATED BIPHENYLS
VOCs – VOLATILE ORGANIC COMPOUNDS
SVOCs – SEMIVOLATILE ORGANIC COMPOUNDS
NE – NO EXCEEDANCE
ND – NO DETECTION
NS – NOT SAMPLED
ft bls – FEET BELOW LAND SURFACE

RESULTS SHOWN IN **BOLD** TYPE EXCEED NYSDEC PART 375 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES

RESULTS WITH GRAY BACKGROUND EXCEED NYSDEC PART 375 RESTRICTED RESIDENTIAL SOIL CLEANUP OBJECTIVES

N

50' 0 50'

Title:

SOIL SAMPLE LOCATIONS AND EXCEEDANCES

430 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

INWOOD LOT 9 ASSOCIATES LLC

ROUX

Compiled by: V.S.	Date: 30MAR21	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	2
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y112.02.DWG		

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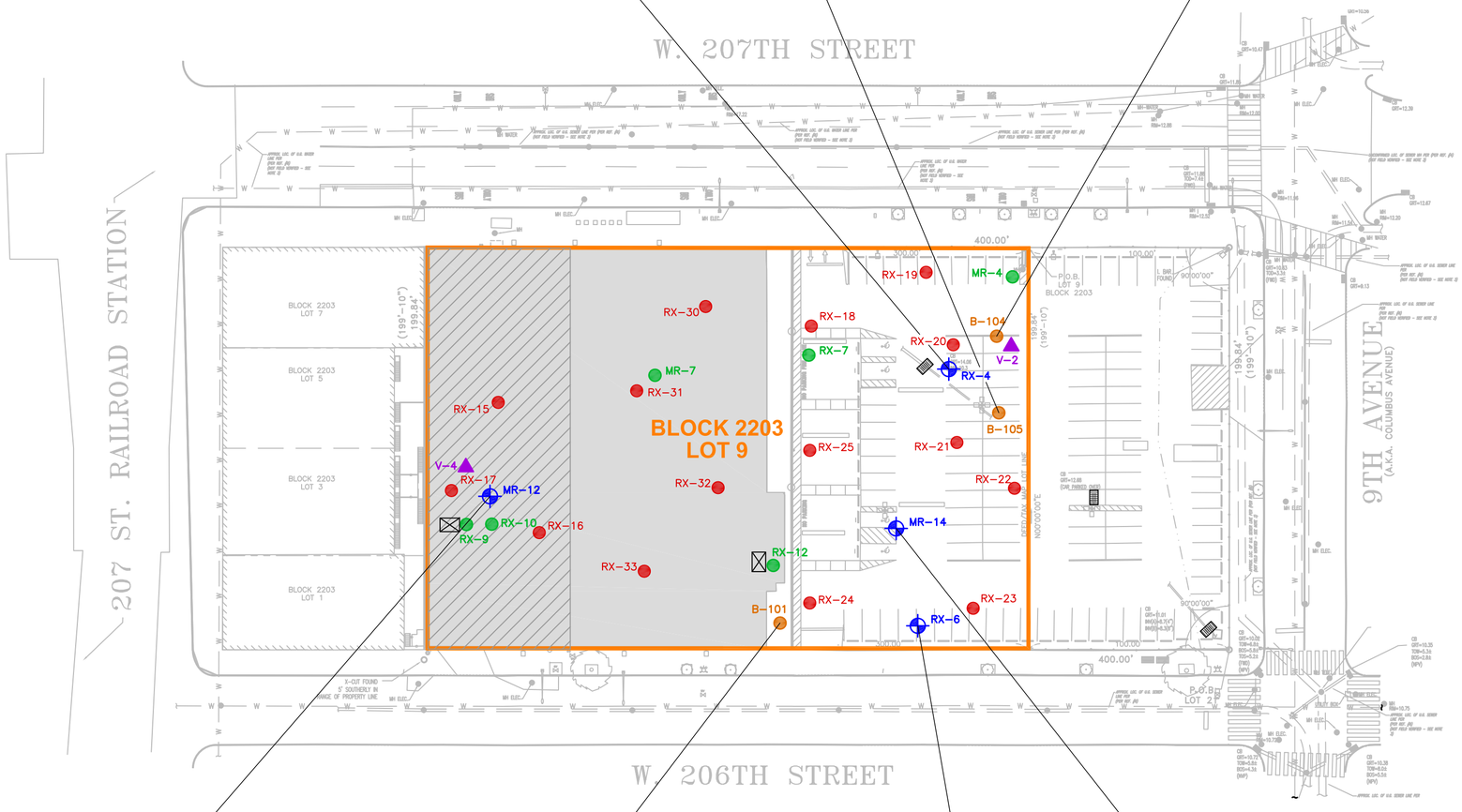
RX-4	9/28/18	9/28/2018 DUP
VOCs	NE	NE
SVOCs		
Benzo[a]anthracene	**6.7**	ND
Benzo[a]pyrene	**6.2**	ND
Benzo[b]fluoranthene	**8**	ND
Benzo[k]fluoranthene	**3.1**	ND
Chrysene	**6.3**	ND
Indeno[1,2,3-cd]pyrene	**3.7**	ND
Phenol	**2.3 J**	**2.0 J**
Metals		
Antimony	**3.8**	NE
Iron	**1600**	**1190**
Lead	**67.2**	NE
Magnesium	**40300**	**55900**
Manganese	**679**	**826**
Sodium	**1290000**	**1400000**

B-105	7/19/11
VOCs	NE
SVOCs	NT
Metals	NE

B-104	7/19/11
VOCs	NE
SVOCs	NE
Metals	NE



MR-12	8/2/18
VOCs	
Benzene	**20**
Ethylbenzene	**6**
m+p-Xylene	**36**
o-Xylene	**29**
Styrene	**14**
Toluene	**23**
SVOCs	
Acenaphthene	**21 J**
Naphthalene	**570**
Metals	
Iron	**12600**
Magnesium	**42800**
Manganese	**634**
Sodium	**124000**

B-101	7/19/11
VOCs	NE
SVOCs	NE
Metals	NE

RX-6	9/28/18
VOCs	ND
SVOCs	NE
Metals	
Iron	**3570**
Magnesium	**137000**
Manganese	**645**
Sodium	**1380000**

MR-14	8/2/18
VOCs	
Chloroform	**7.3**
SVOCs	NE
Metals	
Iron	**1250**
Magnesium	**127000**
Manganese	**374**
Sodium	**901000**

N

50' 0 50'

LEGEND

- MR-12 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION
- RX-7 — SOIL BORING LOCATION AND DESIGNATION
- B-101 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY STANTEC, 2011)
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- V-4 — SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- CATCH BASIN
- SITE
- GROCERY STORE FOOTPRINT
- GROCERY STORE BASEMENT
- ELEVATOR

TYPICAL DATA BOX INFORMATION

SAMPLE ID# → | **RX-6** | 9/28/18 | ← SAMPLE DATE

ANALYTES → | **VOCs** | ND | — CONCENTRATION (µg/L)
SVOCs	NE
Metals	
Iron	**3570**
Magnesium	**137000**
Manganese	**645**
Sodium	**1380000**

Parameter	NYSDEC AWQSGVs (µg/L)
VOCs	
Benzene	1
Chloroform	7
Ethylbenzene	5
Isopropylbenzene	5
m+p-Xylene	5
o-Xylene	5
Styrene	5
Toluene	5
SVOCs	
Acenaphthene	20
Benzo[a]anthracene	0.002
Benzo[a]pyrene	0
Benzo[b]fluoranthene	0.002
Benzo[k]fluoranthene	0.002
Chrysene	0.002
Indeno[1,2,3-cd]pyrene	0.002
Naphthalene	10
Phenol	1
Metals	
Antimony	3
Iron	300
Lead	25
Magnesium	35000
Manganese	300
Selenium	10
Sodium	20000

CONCENTRATIONS IN µg/L

µg/L – MICROGRAMS PER LITER
NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AWQSGVs – AMBIENT WATER-QUALITY STANDARDS AND GUIDANCE VALUES
T – INDICATES THAT A QUALITY CONTROL PARAMETER HAS EXCEEDED LABORATORY LIMITS
J – ESTIMATED VALUE
DUP – DUPLICATE SAMPLE
VOCs – VOLATILE ORGANIC COMPOUNDS
SVOCs – SEMIVOLATILE ORGANIC COMPOUNDS
NE – NO EXCEEDANCES
ND – NO DETECTION

Title:

GROUNDWATER SAMPLE LOCATIONS AND EXCEEDANCES

430 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

INWOOD LOT 9 ASSOCIATES LLC

ROUX

Compiled by: V.S.	Date: 30MAR21
Prepared by: B.H.C.	Scale: AS SHOWN
Project Mgr: V.S.	Project: 2477.0008Y000
File: 2477.0008Y112.02.DWG	

FIGURE 3

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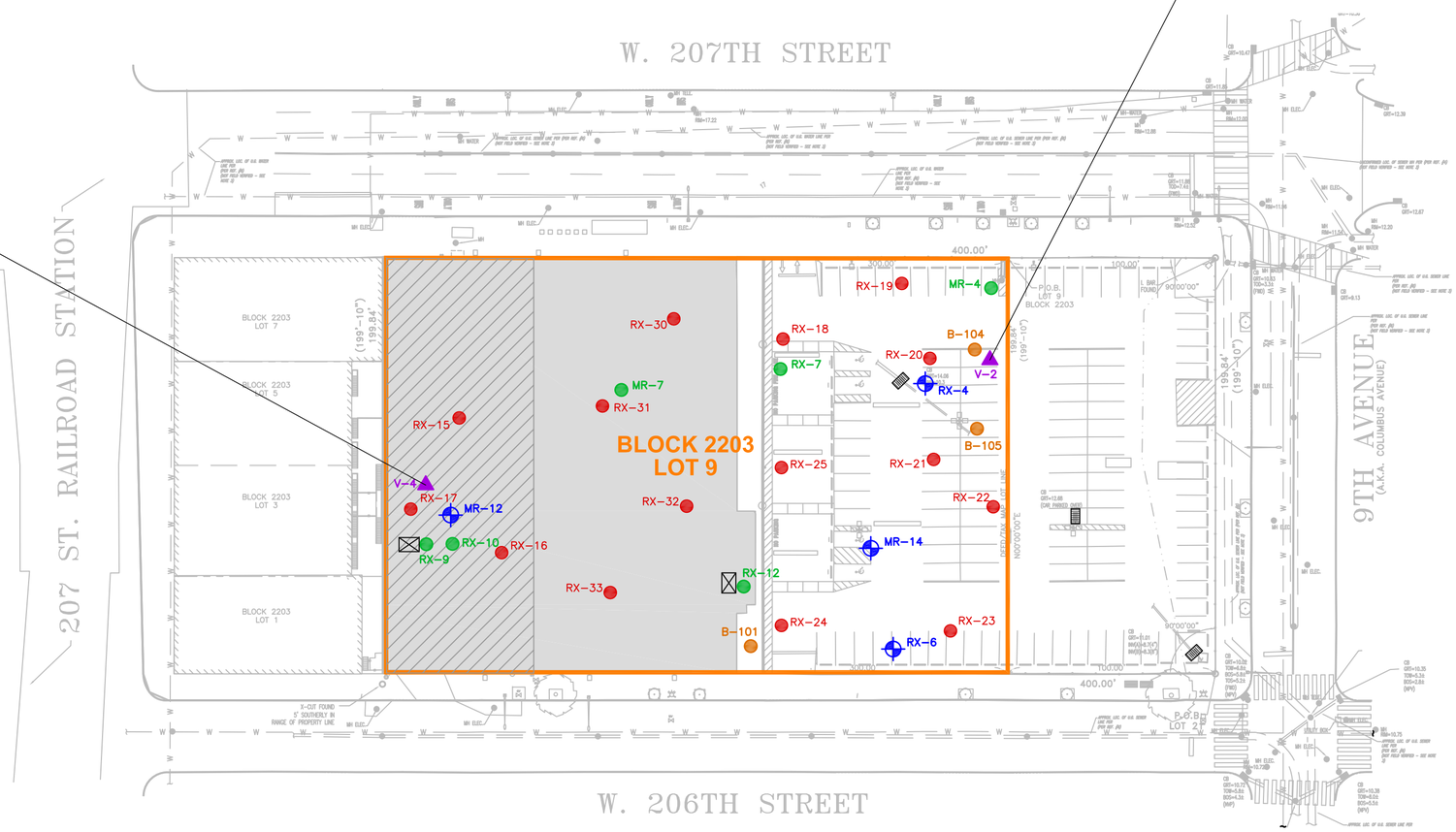
V-4	8/2/18
VOCs	
1,2,4-Trimethylbenzene	4.5
1,3-Butadiene	0.71 J
2-Butanone (MEK)	4.7
Acetone	46
Benzene	7
Bromodichloromethane	93
Butane	90
Carbon disulfide	42
Carbon tetrachloride	0.84
Chlorobenzene	1.4 J
Chlorodifluoromethane	24
Chloroform	320
Chloromethane	2.0 J
Cyclohexane	5.7
Dibromochloromethane	8.2
Ethylbenzene	180
Isooctane	460
Isopropylbenzene	6.8
m+p-Xylene	410
Methyl Methacrylate	44
Methylene chloride	2.6 J
n-Hexane	12
o-Xylene	380
p-Isopropyltoluene	15
Styrene	13
Tetrachloroethene	0.75 J
Toluene	14
Trichloroethene	1.2
Trichlorofluoromethane	21
Xylenes (total)	790

V-2	8/2/18
VOCs	
2-Butanone (MEK)	21 J
Benzene	23
Butane	130
Carbon disulfide	18 J
Chloroform	30
Cyclohexane	29
Ethylbenzene	10 J
Isooctane	2600
Isopropylbenzene	15 J
m+p-Xylene	22 J
N-HEPTANE	100
n-Hexane	87
n-Propylbenzene	14 J
o-Xylene	8.7 J
Tetrachloroethene	47
Toluene	1600
Xylenes (total)	30 J



LEGEND

- MR-12 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION
- RX-7 — SOIL BORING LOCATION AND DESIGNATION
- B-101 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY STANTEC, 2011)
- RX-18 — SOIL BORING LOCATION AND DESIGNATION (INSTALLED BY ROUX, 2021)
- V-4 — SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- CATCH BASIN
- SITE
- GROCERY STORE FOOTPRINT
- GROCERY STORE BASEMENT
- ELEVATOR

TYPICAL DATA BOX INFORMATION

SAMPLE ID# → | V-3 | 8/2/18 | ← SAMPLE DATE

ANALYTES	V-3	8/2/18	SAMPLE DATE
	VOCs		
	Benzene	5400 J	CONCENTRATION (µg/m³)
	Butane	24000	
	Cyclohexane	11000	
	Isooctane	1100000	
	Isopropylbenzene	5300 J	
	N-HEPTANE	24000	
	n-Hexane	20000	
	n-Propylbenzene	4500 J	

CONCENTRATIONS IN µg/m³

µg/m³ – MICROGRAMS PER CUBIC METER
VOCs – VOLATILE ORGANIC COMPOUNDS
J – ESTIMATED VALUE

N

50' 0 50'

Title:

SOIL VAPOR SAMPLE LOCATIONS AND DETECTIONS

430 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

INWOOD LOT 9 ASSOCIATES LLC

ROUX

Compiled by: V.S.	Date: 30MAR21	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	4
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y112.02.DWG		

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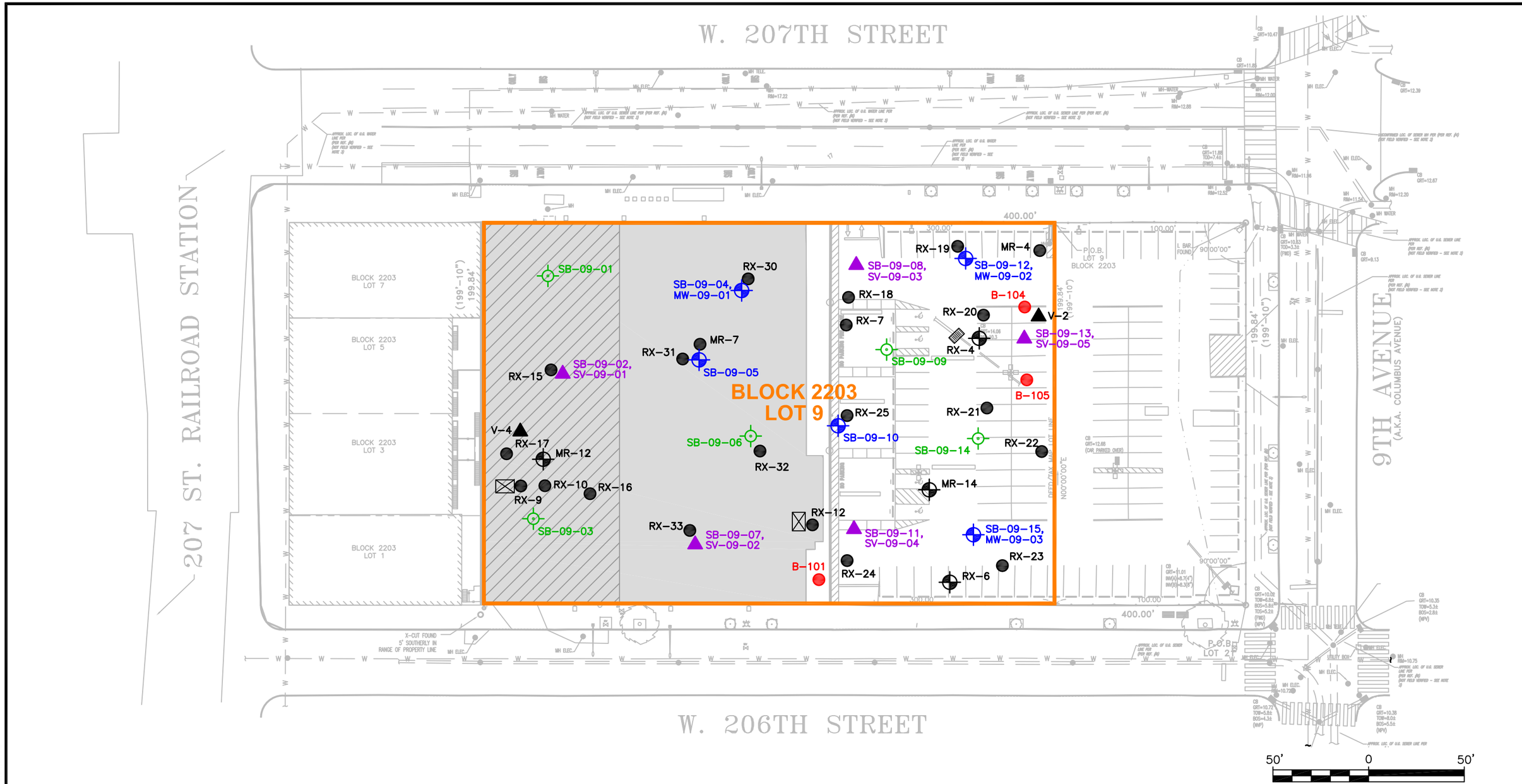

LEGEND

- SB-09-04, MW-09-01 — PROPOSED SOIL BORING AND MONITORING WELL LOCATION AND DESIGNATION
- SB-09-14 — PROPOSED SOIL BORING LOCATION AND DESIGNATION
- SB-09-02, SV-09-01 — PROPOSED SOIL BORING AND SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- B-101 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY STANTEC, 2011)
- MR-12 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION PREVIOUSLY INSTALLED
- V-4 — SOIL VAPOR SAMPLING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
- RX-7 — SOIL BORING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
- GROCERY STORE FOOTPRINT
- GROCERY STORE BASEMENT
- ELEVATOR
- CATCH BASIN
- SITE BOUNDARY

REFERENCE:
CONTROL POINT SURVEY V-001.00 DATED 7/10/2018

Title:

PROPOSED REMEDIAL INVESTIGATION SAMPLING LOCATIONS

410 WEST 207TH ACQUISITION LLC
430 W 207TH STREET
NEW YORK, NEW YORK

Prepared for:
INWOOD LOT 9 ASSOCIATES LLC

ROUX

Compiled by: V.S.	Date: 30MAR21	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	5
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y112.01.DWG		

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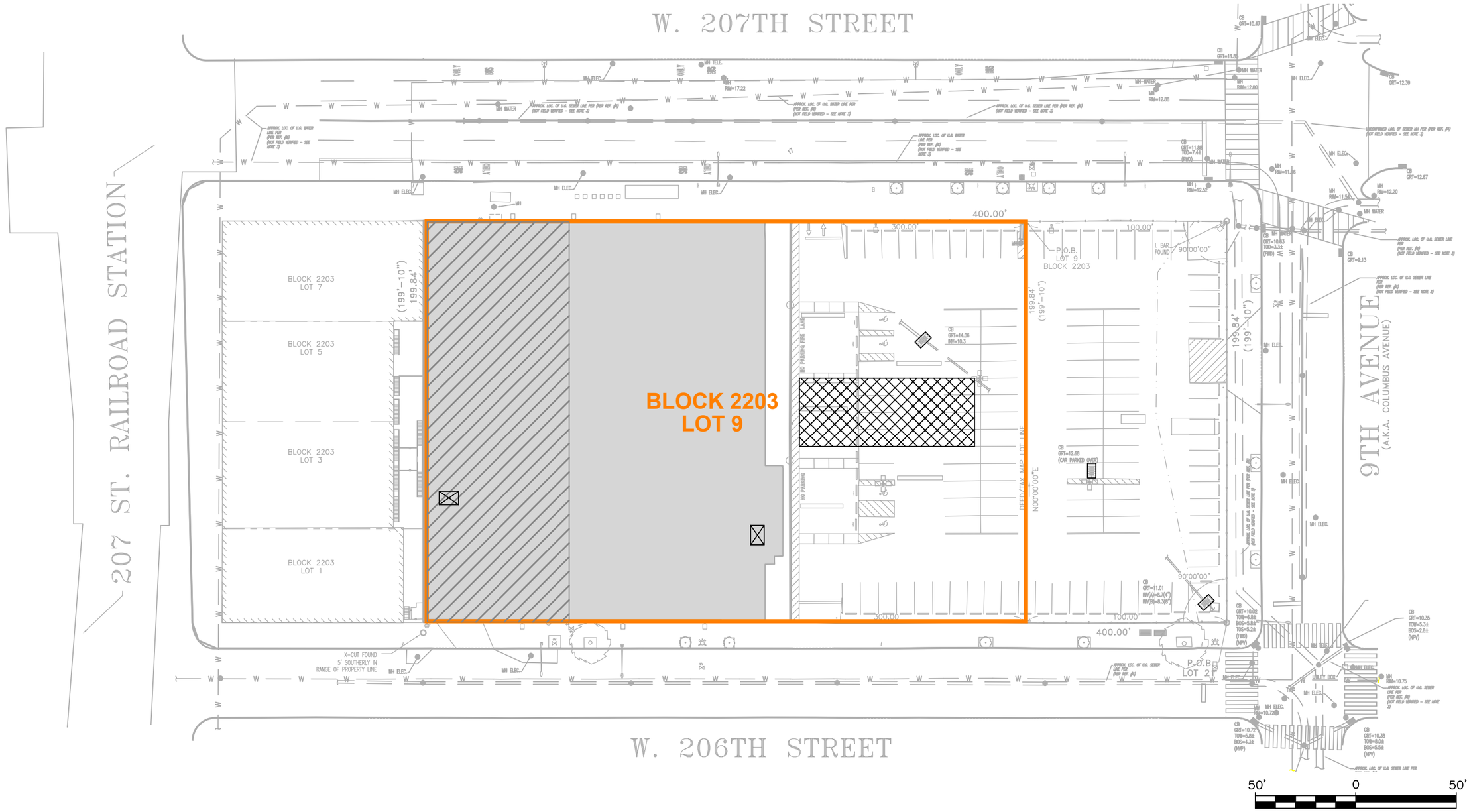

LEGEND

- GROCERY STORE FOOTPRINT
- GROCERY STORE BASEMENT
- ELEVATOR
- CATCH BASIN
- SITE BOUNDARY
- FOUNDATION PILES AND PILE CAP TO BE INSTALLED WITHIN THIS AREA

N

REFERENCE:
CONTROL POINT SURVEY V-001.00 DATED 7/10/2018

Title:

PROPOSED IRM ACTIVITY LOCATIONS

410 WEST 207TH ACQUISITION LLC
430 W 207TH STREET
NEW YORK, NEW YORK

Prepared for:
INWOOD LOT 9 ASSOCIATES LLC

ROUX

Compiled by: V.S.	Date: 12APR21	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	6
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y112.03.DWG		

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APPENDICES

A. Previous Environmental Investigations
B. Community Air Monitoring Plan
C. Quality Assurance Project Plan/Field Sampling Plan
D. Site-Specific Health and Safety Plan

APPENDIX A

Previous Environmental Investigations

APPENDIX B

Community Air Monitoring Plan

Community Air Monitoring Plan

430 West 207th Street
Inwood, New York
Block 2203 Lots 9

March 29, 2021

Prepared for:

Inwood Lot 9 Associates, LLC
111 Eighth Avenue
New York, New York 10011

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

2477.0008Y114/CV

Table of Contents

Table

Appendices

1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux) on behalf of Inwood Lot 9 Associates, LLC, (the "Requestor"), has developed a project specific Community Air Monitoring Plan (CAMP) to implement real time monitoring at the property located at 430 W 207th Street, Inwood, New York (Site), which occupies Tax Lot 9 of Tax Block 2203, during remedial investigation activities.

The monitoring program will be implemented at all times during which earth disturbance activities are occurring. The CAMP is designed to provide a measure of protection for the downwind community and on-Site workers not directly involved with the subject work activities from potential airborne contaminant releases as a direct result of remedial and construction activities. This plan is consistent with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan guidance document.

The specifics of the CAMP are presented in the following four (4) sections:

- 1.1 Volatile Organic Compound (VOC) Monitoring Approach
- 1.2 Particulate Monitoring Approach
- 1.3 Meteorological Monitoring Approach
- 1.4 Available Suppression Techniques

1.1 VOC Monitoring Approach

Total VOC concentrations in air will be monitored continuously at a location downwind of the investigation activities during all ground intrusive activities. An upwind monitoring station will be set up adjacent to where the intrusive activities are occurring. The VOC monitoring equipment will be located at temporary monitoring stations that will be established daily based on Site logistics and weather conditions. The monitoring work will be conducted using MiniRAE 3000 (or equivalent) portable VOC monitors, or similar type monitors, for all VOC monitoring. The equipment will be calibrated at least once daily using isobutylene as the calibration gas. One (1) upwind and one (1) downwind monitor will be deployed each day. Each monitoring unit is equipped with an audible alarm to indicate exceedance of the action levels (as defined below and summarized in Table 1).

The equipment is capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total VOCs at the downwind perimeter of the Site exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If the ambient air concentration of total VOCs at the downwind perimeter of the Site persists at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of VOCs identified, suppression techniques employed to abate emissions, and monitoring continued. After these steps, work activities can resume if the total organic vapor level at the Site perimeter is below 5 ppm over the background concentration for the 15-minute average. If levels are in excess of 25 ppm above background, identified contributing ground-intrusive activities will be halted and vapor suppression techniques will be evaluated and modified until monitoring indicates VOC levels at the Site perimeter are below 5 ppm over background. Once VOC levels are below 5 ppm at the Site perimeter, work will resume with continued monitoring.

- All 15-minute readings will be recorded and be available for State Regulator (New York State Department of Environmental Conservation [NYSDEC] and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes will be recorded. If an exceedance of the action level occurs, an Action Limit Report (ALR) will be completed, identifying the monitoring device location, the measured VOC level, the activity causing the exceedance, meteorological conditions, and the corrective actions taken, as provided in Appendix A. Additionally, the NYSDEC and NYSDOH will be notified within 24 hours of the VOC ALR generation. Daily monitoring equipment locations and meteorological conditions will also be documented on the daily CAMP Monitoring Location Plan. All documentation will be kept on file at the Site.

1.2 Particulate Monitoring, Response Levels and Actions

Particulate concentrations will be monitored continuously at temporary particulate monitoring stations set up at the sidewalk at upwind and downwind locations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action levels (as defined below and summarized in Table 1). Monitoring equipment will be TSI DustTrak II monitors or equivalent. A minimum of one (1) upwind and one (1) downwind monitor will be deployed each day, equipped with an omni-directional sampling inlet and a PM-10 sample head. The data logging averaging period will be set to 15-minutes with time and date stamp recording. Alarm averaging will be set at 90 micrograms per cubic meter (µg/m^3) per 15-minute period. This setting will allow proactive evaluation of Site conditions prior to reaching Action Levels of 100 µg/m^3 above background. The equipment will be outfitted with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities. The monitoring will be used to compare values to the following:

- If the downwind PM-10 particulate level is 100 µg/m^3 greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the Site, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the Site.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 µg/m^3 above the upwind level, work must be stopped, a re-evaluation of activities initiated, and dust suppression techniques modified. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

All 15-minute readings will be recorded and be available for State Regulator (NYSDEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes will be recorded. If an exceedance of the action level occurs, an ALR will be completed, identifying the monitoring device location, the measured particulate concentration, the activity causing the exceedance, meteorological conditions, and the corrective actions taken, as provided in Appendix A. Daily monitoring equipment locations will also be documented on the daily CAMP Monitoring Location Plan. All documentation will be kept on file at the Site.

1.3 Meteorological Monitoring

Wind speed (estimated) and wind direction, will be approximated based on field observations of on-Site personnel. Meteorological data consisting of temperature, barometric pressure, and relative humidity will be recorded in the field book based upon publically available information from local weather stations.

1.4 Available Suppression Techniques

Odor Control

Due to the nature of the project, with intrusive activities occurring, the potential for generation of nuisance odors and the need for odor control may be necessary. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. Both NYSDEC and NYSDOH will be notified of all nuisance odor events and of all other complaints about the project.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) use of chemical odorants in spray or misting systems; and, (e) use of staff to monitor odors in surrounding neighborhoods.

Dust Control

Due to the nature of the project, the potential for generation of nuisance dust and the need for dust control may be necessary. Dust suppression will be achieved through the use of water for wetting excavation areas, if required. Water will be available on-Site at suitable supply and pressure for use in dust control.

1.5 Reporting

All recorded monitoring data will be downloaded, and field logged periodically, including action limit reports (if any) and daily CAMP monitoring location plans. All records will be maintained on-Site and available for NYSDEC/NYSDOH review. A summary of CAMP findings, including excursions, will be provided in the Daily and Monthly Reports. All CAMP monitoring records will be included in the overall Final Engineering Report (FER) that will be submitted to the NYSDEC and NYSDOH and will include all of the CAMP data collected, daily monitoring station location maps, and copies of the ALRs (if any). If an ALR is generated due to VOC exceedances, the NYSDEC and NYSDOH will be notified within 24 hours of the exceedance.

TABLE

1. Action Limit Summary for VOCs and Particulates

Table 1. Action Limit Summary for VOCs and Particulates

Contaminant	Downwind Action Levels*	Action/Response
Volatile Organic Compounds (VOCs) (Monitoring Via Photoionization Detector and Odor Observation)	< 5 ppm	1. Resume work with continuing monitoring.
	5 ppm < level < 25 ppm	1. Work activities must be temporarily halted, source vapors must be identified, suppression techniques employed to abate emissions and monitoring continued. 2. After these steps, if VOC levels (200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or structure, whichever is less) is below 5 ppm over background, resume work.
	> 25 ppm	1. Identified contributing ground intrusive activities must be halted and vapor suppression techniques must be evaluated and modified until monitoring indicates VOC levels below the action level. 2. After these steps, if VOC levels (half the distance to the nearest potential receptor or structure) are below 5 ppm over background, resume work.
Particulates (Monitoring Via Particulate Meter and Observation)	< 100 ug/m^3	1. If dust is observed leaving the work area, then dust control techniques must be implemented or additional controls used.
	100 ug/m3 < level < 150 ug/m^3	1. Employ dust suppression techniques. 2. Work may continue with dust suppression techniques provided that downwind PM-10 particulate concentration do not exceed 150 ug/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
	> 150 ug/m^3	1. STOP work 2. Re-evaluate activities, modify dust suppression techniques. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 ug/m^3 of the upwind level and in preventing visible dust migration.

* Instantaneous readings above background. Particulate readings are based on the respirable (PM-10) fraction. Background readings are taken at upwind locations relative to Work Areas or Exclusion Zones.

APPENDICES

A. Action Limit Report

APPENDIX A

Action Limit Report

ACTION LIMIT REPORT

Project Location: 430 West 207th St, Inwood, NY
Tax Block 2203 Lot 9

Date: _____ Time: _____

Name: _____

Contaminant: PM-10: _____ VOC: _____

Wind Speed: _____ Wind Direction: _____

Temperature: _____ Barometric Pressure: _____

DOWNWIND DATA

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

UPWIND DATA

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

BACKGROUND CORRECTED LEVELS

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

ACTIVITY DESCRIPTION

CORRECTIVE ACTION TAKEN

APPENDIX C

Quality Assurance Project Plan/Field Sampling Plan

Quality Assurance Project Plan/ Field Sampling Plan

430 West 207th Street
Inwood, New York
Block 2203 Lots 9

April 15, 2021

Prepared for:

Inwood Lot 9 Associates, LLC
111 Eighth Avenue
New York, New York 10011

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

2477.0008Y115/CV

Table of Contents

Tables

Figures

Attachments

Table of Contents (Continued)

1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of Inwood Lot 9 Associates LLC (The Applicant), has prepared this Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) to describe the measures that will be taken to ensure the data generated during performance of the Remedial Investigation (RI) for the site located at 430 W 207th Street, Inwood, New York (Site, Figure 1) are of quality sufficient to meet project-specific data quality objectives (DQOs). This QAPP/FSP also includes field sampling procedures.

This QAPP/FSP was prepared in accordance with the guidance provided in NYSDEC Technical Guidance DER-10 Technical Guidance for Site Investigation and Remediation (DER-10), the NYSDEC BCP Guide, and the United States Environmental Protection Agency's (USEPA's) Guidance for the Data Quality Objectives Process (EPA QA/G 4).

1.1 Purpose

The QAPP/FSP describes in detail the field sampling and quality assurance/quality control (QA/QC) methods to be used during soil, soil vapor, and groundwater sampling tasks performed during the RI.

This QAPP/FSP provides guidelines and procedures to be followed by field personnel during performance of sampling during the RI. Information contained in this QAPP/FSP relates to:

- Sampling objectives (Section 2);
- Project organization (Section 3);
- Sample media, sampling locations, analytical suites, sampling frequencies and analytical laboratory (Section 4);
- Field sampling procedures (Section 5);
- Sample handling, sample analysis, and quality assurance/quality control (Section 6); and
- Site control procedures and decontamination (Section 7).

2. Sampling Objectives

The objective of the proposed sampling is to determine the nature and extent of the known contamination at the Site, to evaluate any additional areas of concern (AOCs), and to obtain a current representation of the environmental conditions at the Site.

Roux, as well as a previous consultant, have performed a preliminary Site reconnaissance and investigation and have identified AOCs. These areas will be further investigated as part of the RI. An inspection of the existing Site conditions will be conducted to determine final locations of soil borings, monitoring wells, and soil vapor sampling points based on actual field conditions.

Sampling procedures are discussed in Section 5 of this QAPP/FSP. A discussion of the DQOs and quality assurance/quality control is provided in Section 6.

3. Project Organization

A general and generic summary of the overall management structure and responsibilities of project team members are presented below. Professional profiles for the team are provided in Attachment 1.

Project Principal

Jessica Taylor, P.G. will serve as Project Principal. The Project Principal is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the investigation.

Remedial Engineer

The Remedial Engineer for this project will be Ms. Noelle Clarke, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the RI and future remedial program for the Site. The Remedial Engineer will certify remedial documents, as necessary.

Project Manager

Valerie Sabatasso of Roux will serve as Project Manager. The Project Manager will provide overall management for the implementation of the scope of work and will coordinate all field activities. The Project Manager is also responsible for data review/interpretation and report preparation.

Field Team Leader

The Field Team Leader will be Daniel Miserendino. The Field Team Leader bears the responsibility for the successful execution of the field program. The Field Team Leader will direct the activities of the technical staff in the field, as well as all subcontractors. The Field Team Leader will also assist in the interpretation of data and in report preparation. The Field Team Leader reports to the Project Manager.

Laboratory Project Manager

Laboratory analysis will be completed by Eurofins/Test America Laboratories of Edison, New Jersey, and Burlington, Vermont, both NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratories (11452 and 10391). The Laboratory Project Manager is Melissa Haas. The Laboratory Project Manager is responsible for sample container preparation, sample custody in the laboratory, and completion of the required analysis through oversight of the laboratory staff. The Laboratory Project Manager will ensure that quality assurance procedures are followed and that an acceptable laboratory report is prepared and submitted. The Laboratory Project Manager reports to the Project Principal and Project Manager.

Quality Assurance Officer

David Kaiser, P.E. of Roux will serve as the Quality Assurance Officer (QAO) for this project. The QAO is responsible for conducting reviews, inspections, and audits to ensure the data collection is conducted in accordance with the FSP and QAPP. The QAO's responsibilities range from ensuring effective field equipment decontamination procedures and proper sample collection to the review of all laboratory analytical data for completeness and usefulness. The QAO reports to the Project Manager and makes independent recommendations to the Field Team Leader.

4. Sample Media, Locations, Analytical Suites, and Frequency

The media to be sampled during the RI include soil, groundwater, and soil vapor. Sampling locations, analytical suites, and frequency may vary by medium. A discussion of the sampling schedule for each medium is provided below, while the assumed number of field samples to be collected for each medium, including quality control (QC) samples, is shown in Tables 1 and 2. Specifics regarding the collection of samples at each location and for each task are provided in Section 5 of this QAPP/FSP.

4.1 Soil Sampling

Soil samples are to be used to characterize the soil conditions for the AOCs at the Site, provide vertical delineation of contamination, and to collect the data sufficient to define the nature and extent of impacted soils. All samples previously collected by Roux were done so in a manner consistent with this QAPP/FSP. As part of this RIWP, 15 soil borings are proposed to be installed at the locations shown on Figure 2.

The summary table below provides details for the soil sampling locations that are proposed as part of this RIWP:

Location	Sample Depth Intervals (in ft bls unless otherwise noted)	Rationale
SB-09-01	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-30; sample SB-09-01 is co-located with monitoring well MW-09-01.
SB-09-02	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-19; sample SB-09-02 is co-located with monitoring well MW-09-02.
SB-09-03	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-23; sample SB-09-03 is co-located with monitoring well MW-09-03.
SB-09-04	0-2, Hold 4-6 (depths are feet below basement slab)	To additional soil and soil vapor coverage within the existing basement; sample SB-09-04 is co-located with soil vapor sample SV-09-04.
SB-09-05	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-33; sample SB-09-05 is co-located with soil vapor sample SV-09-05.
SB-09-06	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-18; sample SB-09-06 is co-located with soil vapor sample SV-09-06.
SB-09-07	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-12; sample SB-09-07 is co-located with soil vapor sample SV-09-07.
SB-09-08	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-20; sample SB-09-08 is co-located with soil vapor sample SV-09-08.
SB-09-09	0-2, Hold 4-6 (depths are feet below basement slab)	To evaluate conditions in an area of the Site not previously investigated.

Location	Sample Depth Intervals (in ft bls unless otherwise noted)	Rationale
SB-09-10	4-6, Hold 6-8 (depths are feet below basement slab)	To provide additional data for the southwest corner of the Site.
SB-09-11	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near MR-7.
SB-09-12	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-32.
SB-09-13	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near RX-25.
SB-09-14	12-14; Hold 14-16 and 16-18	To evaluate conditions in an area of the Site not previously investigated.
SB-09-15	12-14; Hold 14-16 and 16-18	To delineate vertical extent of contamination near MR-14.

Samples will be analyzed for Total Compound List (TCL) plus 30/ Target Analyte List (TAL) (TCL + 30/TAL) which includes:

- TCL Volatile Organic Compunds (VOCs) + 10 tentatively identified compounds (TICs);
- TCL base neutral acids (BNA)/Semivolatile Organic Compounds (SVOCs) + 20 TICs;
- TCL Pesticides;
- TCL Herbicides;
- TCL Polychlorinated biphenyls (PCBs);
- TAL) Metals (including hexavalent chromium); and
- Total Cyanide.

Samples will also be analyzed for the Emerging Contaminants (ECs) list including 1,4-Dioxane and the 21 Per- and Polyfluoroalkyl Substances (PFAS), which include the 21 compounds listed in the January 2021 NYSDEC guidance Sampling, Analysis, and Assessment of Per-and Polufluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs (NYSDEC January 2021 Guidance) and is is included as Attachment 2. PFAS in soil will be analyzed Modified USEPA Method 537 via LC-MS/MS isotope dilution. 1,4-Dioxane in soil will be analyzed by USEPA Method 8270D. The 21 PFAS are:

- Perfluorobutanesulfonic acid
- Perfluorohexanesulfonic acid
- Perfluoroheptanesulfonic acid
- Perfluorooctancessulfonic acid
- Perfluorodecanesulfonic acid
- Perfluorobutanoics acid
- Perfluoropentanoic acid
- Perfluorohexanoic acid
- Perfluoroheptanoic acid
- Perfluorooctanoic acid
- Perfluorononanoic acid
- Perfluorodecanoic acid

- Perfluoroundecanoic acid
- Perfluorododecanoic acid
- Perfluorotridecanoic acid
- Perfluorotetradecanoic acid
- 6:2 Fluorotelomer sulfonate
- 8:2 Fluorotelomer sulfonate
- Perfluroroctanesulfonamide
- N-methyl perfluorooctanesulfonamidoacetic acid
- N-ethyl perfluorooctanesulfonamidoacetic acid

The Test America Standard Operating Procedures (SOPs) for completing ECs analysis and reporting limits/minimum detection limits for EC compounds are included in Attachment 3. If odor/ visual evidence of contamination or elevated photoionization detector (PID) readings are noted, additional samples may be collected from the interval that exhibits the highest contamination.

4.2 Groundwater Sampling

To characterize on-Site groundwater flow and quality conditions, three permanent groundwater monitoring wells will be installed across the Site. Based on data from previous environmental investigations conducted by Roux, the average depth to groundwater is approximately 9-12 ft bls. The three permanent groundwater monitoring wells (MW-09-01 through MW-09-03) will be installed to a maximum depth of approximately 19 feet below land surface (ft bls). All permanent monitoring wells will be installed with a ten-foot well screen bridging the water table (i.e., three feet of screen above the water table and seven feet of well screen below). The proposed permanent groundwater monitoring well locations are shown on Figure 2 and permanent monitoring well installation and groundwater sampling procedures are outlined below in Section 5.2.

Groundwater samples will be collected from the permanent wells and submitted for laboratory analysis for TCL + 30/TAL analysis (including filtered and unfiltered metals and SVOCs). The proposed permanent monitoring wells will also be sampled for the emerging contaminants (ECs) 1,4-Dioxane and Per- and Polyfluoroalkyl Substances (PFAS), which include the 21 compounds listed in the NYSDEC January 2021 Guidance. PFAS in groundwater will be analyzed Modified USEPA Method 537 via LC-MS/MS isotope dilution. 1,4-Dioxane in groundwater will be analyzed by USEPA Method 8270D SIM. The Test America Standard Operating Procedures (SOPs) for completing ECs analysis and reporting limits/minimum detection limits for EC compounds are included in Attachment 3. Field parameters (e.g., pH, dissolved oxygen, oxidation-reduction potential [ORP], etc.) will also be collected in the field using a water quality meter during purging prior to sample collection.

4.3 Soil Vapor Sampling

Five soil vapor samples (SV-09-04 through SV-09-08) will be collected during the RI to evaluate soil vapor conditions at the Site. The proposed soil vapor sampling locations are shown on Figure 2. All soil vapor samples will be collected in accordance with the October 2006 New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH Guidance). All soil vapor samples will be collected from a depth of approximately 2 ft above the water table, except for SV-09-04 which will be collected from beneath the basement slab. All soil vapor samples will be analyzed for VOCs using USEPA Method TO-15. Soil vapor point installation and soil vapor sampling procedures are outlined below is Section 5.3.

5. Field Sampling Procedures

This section provides a detailed discussion of the field procedures to be used during sampling of the various media being evaluated as part of the RI (i.e., soil, groundwater, and soil vapor). As discussed, the sample locations are shown on Figure 2 and additional information including intervals to be sampled and sample rationale is provided in section 4.1. Additional details regarding sampling procedures and protocols are described in Roux's relevant SOPs, which are provided in Attachment 4.

5.1 Soil Sampling and Permanent Monitoring Well Installation

Details for the collection of soil samples and the installation of permanent monitoring wells are provided below. Boreholes will be pre-cleared to five ft bls using non-intrusive methods (i.e., hand auger, vacuum technology, etc.) prior to advancement of soil borings to verify the absence of potential underground utilities. Should a utility or other feature be observed during pre-clearance activities, the sampling location will be relocated to no greater than ten feet away from the original proposed location.

5.1.1 Soil Sampling

Soil borings will be advanced using a GeoProbe® Direct-Push drill rig. Samples of the soil profile will be collected continuously from land surface to a maximum depth of approximately 18 ft bls, as shown in Section 4.1.

The soil from each five-foot interval will be observed for lithology and evidence of contamination (e.g., staining, odors, and/or visible free product) and placed immediately thereafter into large Ziploc® bags for recording headspace using a PID. After a minimum of 15 minutes for equilibration with the headspace in the Ziploc® bag, each sample will be screened for organic vapors using a PID equipped with a 10.6 eV lamp. Samples for possible VOC analysis will be placed in a laboratory-supplied jar or encore sampler prior to screening, due to the potential for loss of VOCs through volatilization. Soil samples will be collected accordance with the table in section 4.1. These samples will be placed in the laboratory-supplied containers and shipped to the laboratory under chain of custody procedures in accordance with Roux's SOPs in Attachment 4.

Additional necessary precautions will be taken when sampling for ECs in the field including, but not limited to:

- Using the proper field clothing or personal protective equipment (i.e., no materials will contain Gore-Tex or Tyvek);
- Avoid using sampling equipment components/containers making contact with aluminum foil, low density polyethylene (LDPE), glass, or polytetrafluoroethylene materials;
- Following PFAS field sampling guidelines (i.e., using sampling materials made from high density polyethylene [HDPE], silicon, or stainless steel and avoid using equipment containing Teflon and using permanent markers, adhesives, and waterproof/plastic clipboards and notebooks); and
- Utilizing regular ice for sample presevation and only Alconox or Liquinox for decontamination.

Following sample collection, boreholes will be backfilled with soil cuttings with a bentonite plug near the top and capped with concrete. Contaminated soil cuttings, if encountered, will be placed in sealed and labeled U.S. Department of Transportation (DOT) approved 55-gallon drums pending characterization and off-site disposal at a permitted facility.

5.1.2 Permanent Monitoring Well Installation

Permanent sidewalk monitoring wells will be installed bridging the water table and to a maximum depth of approximately 15 ft bls. Monitoring wells will be constructed of 2 inch inside diameter, Schedule 40 polyvinyl chloride (PVC) casing and, 0.020-inch slot screen. Well screens will be 10 feet long and will be installed with three feet above and seven feet below the water table. A sand pack will be placed around the well screen, extending two feet above the top of the screened zone. Once the driller confirms the depth of the sand pack, a minimum two-foot-thick bentonite pellet seal will be placed above the sand pack. Once the pellets have been allowed to hydrate, a cement bentonite grout will be placed into the remaining annular space from the bottom up to just above the bentonite seal. The wells will be completed using locking well plugs, and flush mounted, bolt down, watertight, manhole covers cemented into place.

Each newly installed monitoring well will be developed to remove any fine-grained material in the vicinity of the well screen and to promote a hydraulic connection with the aquifer. The wells will be developed using a submersible pump, which will be surged periodically until well yield is consistent and has a turbidity below 50 Nephelometric turbidity units (NTUs).

5.2 Groundwater Sampling

Groundwater samples from the proposed permanent monitoring wells will be collected no sooner than one (1) week following development of the wells. Prior to sampling, depth to water will be measured at each newly installed temporary and newly installed and existing permanent well using an electronic water level meter with an accuracy of +/ 0.01 feet. All wells will then be purged and sampled using a submersible pump or low-flow method, or an alternative method, depending on the observed depth to groundwater and logistical issues. Purging and sampling will be performed consistent with USEPA low-flow sampling requirements. Field parameters (i.e., pH, dissolved oxygen, ORP, etc. as described in the USEPA low-flow sampling requirements) will be collected using a water quality meter with flow-through cell until parameters stabilized before samples are collected. Samples will be analyzed for TCL + 30/TAL and ECs as shown on Table 2.

Similar to the collection of soil samples for ECs, additional necessary precautions will be taken when groundwater sampling for ECs in the field including, but not limited to:

- Using the proper field clothing or personal protective equipment (i.e., no materials will contain Gore-Tex or Tyvek);
- Avoid using pumps and sampling equipment components/containers making contact with aluminum foil, low density polyethylene (LDPE), glass, or polytetrafluoroethylene materials;
- Following PFAS field sampling guidelines (i.e., using sampling materials made from high density polyethylene [HDPE], silicon, or stainless steel and avoid using equipment containing Teflon and using permanent markers, adhesives, and waterproof/plastic clipboards and notebooks); and
- Utilizing regular ice for sample presevation and only Alconox or Liquinox for decontamination.

All groundwater samples will be collected and placed in the laboratory-supplied containers and shipped to the laboratory under chain of custody procedures in accordance with Roux's field sampling SOPs included as Attachment 4.

5.3 Soil Vapor Sampling

Five soil vapor samples will be collected during the RI to evaluate soil vapor concentrations at the Site Soil vapor sample SV-09-04 will be installed below the basement slab and samples SV-09-05 through SV-09-08 will be installed approximately two feet above the water table. New Teflon®-lined tubing will be attached to an expendable soil vapor sampling point with a 6-inch stainless steel screen inside the rods, to prevent infiltration of ambient air. The soil vapor points will be backfilled with #2 Morie sand to approximately one foot above the screen. The remainder of the borehole will be backfilled with a cement/bentonite slurry to grade.

Prior to sample collection, the Teflon®-lined tubing will be purged of approximately two volumes of the tubing using a vacuum pump set at a rate of 0.2 liters per minute. A tracer gas (i.e., helium) will be used to enrich the atmosphere in the immediate vicinity of the sampling location in order to test the borehole seal and verify that ambient air is not being drawn into the sample in accordance with the procedures outlined in the NYSDOH Guidance. Following purging and verification with the tracer gas, the tubing will be connected to the pre-cleaned (batch-certified) laboratory supplied six-liter summa canister. All soil vapor samples will be collected using the canisters with regulators calibrated to collect samples over an 8-hour period and analyzed using USEPA Method TO-15 for VOCs.

6. Sample Handling and Analysis

To ensure quality data acquisition and collection of representative samples, there are selective procedures to minimize sample degradation or contamination. These include procedures for preservation of the samples, as well as sample packaging, shipping procedures, and QA/QC.

6.1 Field Sample Handling

A discussion of the proposed number and types of samples to be collected during each task, as well as the analyses to be performed, can be found in Section 4 of this QAPP/FSP. The types of containers, volumes, and preservation techniques for the aforementioned testing parameters are presented in Table 3.

6.2 Sample Custody Documentation

The purpose of documenting sample custody is to ensure that the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis (and return of unused sample portion, if applicable).

Each individual collecting samples is personally responsible for the care and custody of the samples. All sample labels should be pre-printed or filled out using waterproof ink. The technical staff will review all field activities with the Field Team Leader to determine whether proper custody procedures were followed during the field work and to decide if additional samples are required.

All samples being shipped off-site for analysis must be accompanied by a properly completed chain of custody form. The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to/from a secure storage area, and to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and/or secured with strapping tape in at least two locations for shipment to the designated laboratory.

6.3 Sample Shipment

If sample shipment is necessary, sample packaging and shipping procedures are based upon USEPA specifications, as well as DOT regulations. The procedures vary according to potential sample analytes, concentration, and matrix and are designed to provide optimum protection for the samples and the public. Sample packaging and shipment must be performed using the general outline described below.

All samples will be shipped within 24 hours of collection and will be preserved appropriately from the time of sample collection. A description of the sample packing and shipping procedures is presented below:

1. Prepare cooler(s) for shipment:
    - tape drain(s) of cooler shut;
    - affix “This Side Up” arrow labels and “Fragile” labels on each cooler; and
    - place mailing label with laboratory address on top of cooler(s).
2. Arrange sample containers in groups by sample number.

3. Ensure that all bottle labels are completed correctly. Place clear tape over bottle labels to prevent moisture accumulation from causing the label to peel off.
4. Arrange containers in front of assigned coolers.
5. Place packaging material approximately at the bottom of the cooler to act as a cushion for the sample containers.
6. Arrange containers in the cooler so that they are not in contact with the cooler or other samples.
7. Fill remaining spaces with packaging material.
8. Ensure all containers are firmly packed in packaging material.
9. If ice is required to preserve the samples, ice cubes should be repackaged in Ziploc® bags and placed on top of the packaging material.
10. Sign chain of custody form (or obtain signature) and indicate the time and date it was relinquished to courier as appropriate.
11. Separate chain of custody forms. Seal proper copies within a large Ziploc® bag and tape to inside cover of cooler. Retain copies of all forms.
12. Close lid and latch.
13. Secure each cooler using custody seals.
14. Tape cooler shut on both ends.
15. Relinquish to overnight delivery service as appropriate. Retain air bill receipt for project records. (Note: All samples will be shipped for "NEXT A.M." delivery).

6.4 Quality Assurance/Quality Control

The primary intended use for the RI data is to characterize Site conditions and determine if remediation needs to be undertaken at the Site. The primary DQO of the soil, groundwater, and soil vapor programs, therefore, is that data be accurate and precise, and hence representative of the actual Site conditions. Accuracy refers to the ability of the laboratory to obtain a true value (i.e., compared to a standard) and is assessed through the use of laboratory quality control (QC) samples, including laboratory control samples and matrix spike samples, as well as through the use of surrogates, which are compounds not typically found in the environment that are injected into the samples prior to analysis. Precision refers to the ability to replicate a value and is assessed through both field and laboratory duplicate samples.

Sensitivity is also a critical issue in generating representative data. Laboratory equipment must be of sufficient sensitivity to detect target compounds and analytes at levels below NYSDEC standards and guidelines whenever possible. Equipment sensitivity can be decreased by field or laboratory contamination of samples, and by sample matrix effects. Assessment of instrument sensitivity is performed through the analysis of reagent blanks, near-detection-limit standards, and response factors. Potential field and/or laboratory contamination is assessed through use of trip blanks, method blanks, and equipment rinse blanks (also called "field blanks"). Equipment blanks for PFAS will be collected at a minimum frequency of one per day. A laboratory SOP for analysis of PFAS is included in Attachment 3.

Table 1 lists the requirements for field and laboratory QC samples that will be analyzed to assess data accuracy and precision, as well as to determine if equipment sensitivity has been compromised. Table 2 lists the number/type of field and QA/QC samples that will be collected during the RI. Table 3 lists the preservation, holding times and sample container information.

All RI “assessment” analyses will be performed in accordance with the NYSDEC Analytical Services Protocol (ASP), using USEPA SW 846 methods.

All laboratory data are to be reported in NYSDEC ASP Category B deliverables and will be delivered to NYSDEC in electronic data deliverable (EDD) format as described on NYSDEC’s website (http://www.dec.ny.gov/chemical/62440.html). A Data Usability Summary Report (DUSR) will be prepared meeting the requirements in Section 2.2(a)1.ii and Appendix 2B of DER-10 for all data packages generated for the RI.

7. Site Control Procedures

Site control procedures, including decontamination and waste handling and disposal, are discussed below. Site control procedures have been developed to minimize both the risk of exposure to contamination and the spread of contamination during field activities at the Site. All personnel who come into designated work areas, including contractors and observers, will be required to adhere strictly to the conditions imposed herein and to the provisions of a Site-Specific Health and Safety Plan (HASP). The HASP is included as Appendix D to the RIWP.

7.1 Decontamination

In an attempt to avoid the spread of contamination, all drilling and sampling equipment must be decontaminated at a reasonable frequency in a properly designed and located decontamination area. Detailed procedures for the decontamination of field and sampling equipment are included in Roux's SOPs for the Decontamination of Field Equipment located in Attachment 4. The location of the decontamination area will be determined prior to the start of field operations. The decontamination area will be constructed to ensure that all wash water generated during decontamination can be collected and containerized for proper disposal. As mentioned above, only Alconox or Liquinox will be used during decontamination procedures when groundwater sampling is underway.

7.2 Waste Handling and Disposal

All waste materials (drill cuttings, decontamination water, etc.) generated during the RI will be consolidated, and stored in appropriate labeled bulk containers (drums, etc.), and temporarily staged at an investigation derived waste storage area onsite. Roux will then coordinate waste characterization and disposal by appropriate means.

TABLES

1. Field and Laboratory QC Summary
2. Remedial Investigation Sampling Summary
3. Preservation, Holding Times, and Sample Containers

Table 1. Field and Laboratory QC Summary

QC Check Type	Minimum Frequency	Use
Field QC		
Duplicate	1 per matrix per 20 samples or SDG	Precision
Trip Blank	1 per VOC cooler	Sensitivity
Field Blank	1 per matrix per 20 samples, 1 per day when sampling for PFAS	Sensitivity
Equipment Blank	1 per day when sampling for PFAS	Sensitivity
Laboratory QC		
Laboratory Control Sample	1 per matrix per SDG	Accuracy
Matrix Spike/Matrix Spike Duplicate/Matrix Duplica	1 per matrix per SDG	Accuracy/Precision
Surrogate Spike	All organics samples	Accuracy
Laboratory Duplicate	1 per matrix per SDG	Precision
Method Blank	1 per matrix per SDG	Sensitivity

* SDG - Sample Delivery Group - Assumes a single extraction or preparation
** Provided to lab by field sampling personnel
PFAS - Per- and Polyfluoroalkyl Substances

Table 2. Remedial Investigation Sampling Summary

Sample Medium	Target Analytes	Field Samples	Replicates[1]	Trip Blanks[2]	Field Blanks[1]	Equipment Blanks[3]	Matrix Spikes[1]	Spike Duplicates[1]	Total No. of Samples
Soil	TCL VOCs +10	15	1	-	1	-	1	1	19
	TCL VOCs	15	1	-	1	-	1	1	19
	TCL SVOCs +20	15	1	-	1	-	1	1	19
	TCL SVOCs	15	1	-	1	-	1	1	19
	TCL Pesticides	15	1	-	1	-	1	1	19
	TCL Herbicides	15	1	-	1	-	1	1	19
	TCL PCBs	15	1	-	1	-	1	1	19
	TAL Metals	15	1	-	1	-	1	1	19
	Total Cyanide	15	1	-	1	-	1	1	19
	PFAS	15	1	-	1	-	1	1	19
	1,4-Dioxane	15	1	-	1	-	1	1	19
Groundwater	TCL VOCs +10	3	1	1	1	-	1	1	8
	TCL SVOCs +20	3	1	-	1	-	1	1	7
	TCL Pesticides	3	1	-	1	-	1	1	7
	TCL Herbicides	3	1	-	1	-	1	1	7
	TCL PCBs	3	1	-	1	-	1	1	7
	TAL Metals*	3	1	-	1	-	1	1	7
	PFAS	3	1	-	1	1	1	1	8
	1,4-Dioxane	3	1	-	1	1	1	1	8
Soil Vapor	TO-15 VOCs	5	1	-	-	-	-	-	6

Totals are estimated based on scope of work as written, actual sample quantities may vary based on field conditions.
Additional samples will be collected and held, as described in the RIWP. QA/QC sample quantities will be adjusted accordingly.
[1] Based on 1 per 20 samples
[2] Based on 1 VOC cooler per day
[3]Based on 1 per day PFAS sampling occurs
TCL - USEPA Contract Laboratory Program Target Compound List
USEPA - United States Environmental Protection Agency
VOCs - Volatile Organic Compounds
SVOCs - Semivolatile Organic Compounds
PCBs - Polychlorinated Biphenyls
EPH - Extractable Petroleum Hydrocarbons
RCRA - Resource Conservation and Recovery Act
TCLP - Toxicity Characteristic Leaching Procedure
PFAS - Per- and Polyfluoroalkyl Substances
TAL - USEPA Contract Laboratory Program Target Analyte List
*All groundwater samples will be analyzed for both filtered and unfiltered metals.

Table 3. Preservation, Holding Times and Sample Containers

Analysis	Matrix	Bottle Type	Preservation(a)	Holding Time(b)
TAL Metals (total) SW-846 6010/7471	Soil Water	8 oz wide mouth glass, teflon lined cap 250 mL plastic, teflon lined cap	Cool to 4°C Nitric acid	180 days, Hg 28 days
Total Cyanide	Soil	4 oz glass	Cool to 4°C	14 days
PFAA vis EPA 537(M)-Isotope Dilution (WATER) 1,4-Dioxane via 8270SIM	Water Water	Three 250 mL HDPE bottles 500 mL amber glass	Trizma Cool to 4°C	14 days to extraction, 28 days to analysis 7 days to extraction, 40 days to analysis
TO-15	Air	2.7 liter Summa Canister	None	14 days from sample collection
Target Compound List (TCL)				
TCL Volatile Organic Compounds (VOCs) SW-846 8260B	Soil Water	Encore 40mL voa vial, teflon lined cap	Cool to 4°C Hydrochloric Acid	48 hours from sample collection, 14 days if frozen to -7°C or extruded into methanol 14 days from sample collection
TCL Semivolatile Organic Compounds (SVOCs) SW-846 8270C	Soil Water	8 oz wide mouth glass, teflon lined cap 1 liter amber glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis 7 days to extract, 40 days to analysis
TCL Pesticides SW-846 8081A	Soil Water	8 oz wide mouth glass, teflon lined cap 1 liter amber glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis 7 days to extract, 40 days to analysis
TCL Herbicides SW-846 8051A	Soil Water	8 oz wide mouth glass, teflon lined cap 1 liter amber glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis 7 days to extract, 40 days to analysis
TCL Polychlorinated biphenyls (PCBs) SW-846 8082/TCLP	Soil Water	8 oz wide mouth glass, teflon lined cap 1 liter amber glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis 7 days to extract, 40 days to analysis

(a) All soil and groundwater samples to be preserved in ice during collection and transport
(b) Days from date of sample collection.
TAL - Target Analyte List
TCL - USEPA Contract Laboratory Program Target Compound List
USEPA - United States Environmental Protection Agency
HDPE - High Density Polyethylene

FIGURES

1. Site Location Map
2. Proposed Remedial Action Sampling Locations

QUADRANGLE LOCATION

SOURCE:
USGS; 2016, Central Park, NY-NJ
7.5 Minute Topographic Quadrangle

N

0 2000'

Title:

SITE LOCATION MAP

430 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

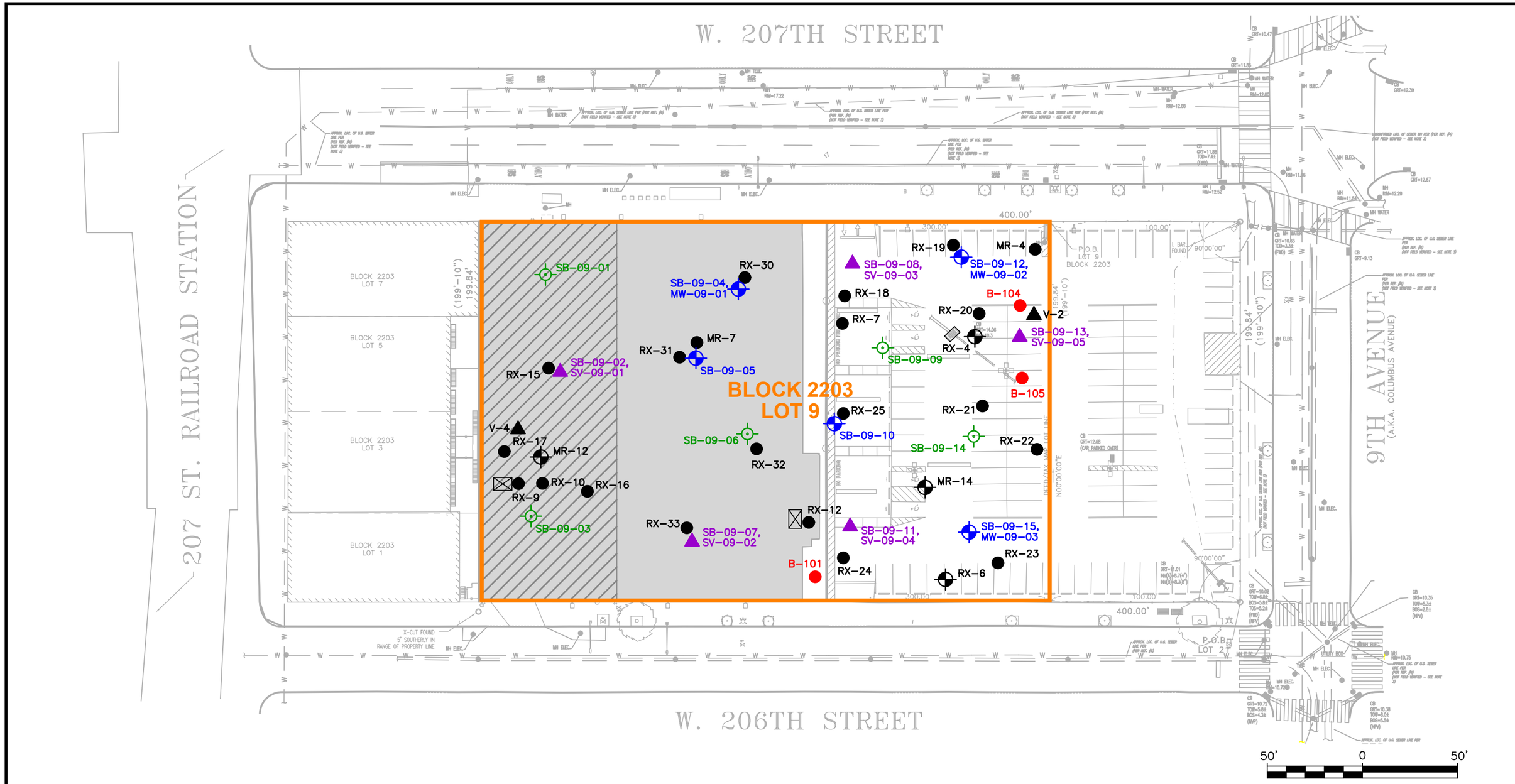
INWOOD LOT 9 ASSOCIATES LLC

ROUX

Compiled by: V.S.	Date: 30MAR21
Prepared by: B.H.C.	Scale: AS SHOWN
Project Mgr: V.S.	Project: 2477.0008Y000
File: 2477.0008Y107.01.CDR	

FIGURE 1

\2477\Y0008\Y112\2477.0008Y112.04.CDR



LEGEND

- SB-09-04, MW-09-01 — PROPOSED SOIL BORING AND MONITORING WELL LOCATION AND DESIGNATION
- SB-09-14 — PROPOSED SOIL BORING LOCATION AND DESIGNATION
- SB-09-02, SV-09-01 — PROPOSED SOIL BORING AND SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- B-101 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY STANTEC, 2011)
- MR-12 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION PREVIOUSLY INSTALLED
- V-4 — SOIL VAPOR SAMPLING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
- RX-7 — SOIL BORING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
- GROCERY STORE FOOTPRINT
- GROCERY STORE BASEMENT
- ELEVATOR
- CATCH BASIN
- SITE BOUNDARY

REFERENCE:
CONTROL POINT SURVEY V-001.00 DATED 7/10/2018

Title:

PROPOSED REMEDIAL INVESTIGATION SAMPLING LOCATIONS

410 WEST 207TH ACQUISITION LLC
430 W 207TH STREET
NEW YORK, NEW YORK

Prepared for:
INWOOD LOT 9 ASSOCIATES LLC

ROUX

Compiled by: V.S.	Date: 15APR21	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	2
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y115.02.DWG		

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ATTACHMENTS

1. Professional Profiles
2. NYSDEC January 2021 PFAS Sampling Guidance
3. Laboratory's Standard Operating Procedures and Detection/Reporting Limits for Emerging Contaminants
4. Roux's Standard Operating Procedures

ATTACHMENT 1

Professional Profiles

ROUX

PROFESSIONAL PROFILE

Noelle M. Clarke, P.E.
Principal Engineer

TECHNICAL SPECIALTIES

Feasibility studies, pilot testing, remedial design, implementation, construction management, and startup evaluations for remediation of soil, groundwater, and sediment. Phase I/Phase II Environmental Site Assessments (ESA). Extensive experience at brownfields redevelopment sites, former industrial facilities, and public works facilities. Evaluation and design of storm water drainage systems. Evaluation, design, and construction management for new and existing wastewater treatment processes.

EXPERIENCE SUMMARY

Thirty years' experience: Principal Engineer/Senior Engineer at Remedial Engineering, P.C./Roux Associates; Project Engineer at Camp Dresser & McKee.

CREDENTIALS

B.S. – Civil Engineering, Manhattan College, 1991
M.E. – Environmental Engineering, Manhattan College, 1994

PAPERS AND PRESENTATIONS

Sparging Targets Submerged Residual Saturation Contamination, written with D. Bennett and L. Buchanan. Presented at the 66th New York Water Environment Federation Association Annual Meeting, New York, New York, February 1994.

Suffolk County Wetlands – Flow Augmentation Needs Study, written with M. A. Taylor and R. Southard. In Proceedings of the Annual Meeting, Hydrology and Hydrogeology of Urban and Urbanizing Areas. American Institute of Hydrology, April 1996.

KEY PROJECTS

- Principal Engineer providing due diligence support for real estate transactions on multiple projects in the New York metropolitan area. Projects have included multi-family housing (both affordable and market rate), retail/ commercial, community services and industrial properties. Services have included Phase I and Phase II ESAs.

- Principal Engineer for a Brownfield redevelopment of a property adjacent to a dry cleaning solvent distribution facility in Brooklyn, New York under the NYSDEC BCP. The site was previously a warehouse built on a former freight railyard that serviced the dry cleaning solvent facility. Offloading spillage on site and migration from the offsite facility resulted in significant soil, groundwater, and vapor contamination with chlorinated VOCs. The site was developed into multifamily housing with first floor retail use. Pre-remediation and posts-remediation Phase I ESAs were prepared by Roux Associates. The remedy, as summarized in the Remedial Action Work Plan (RAWP), consisted of soil hot spot removal, a physical barrier to limit on site migration, a permeable reactive wall to mitigate offsite migration, and a sub slab depressurization system. Roux Associates, under the direction of Ms. Clarke provided full time oversight of the remediation and prepared the Final Engineering Report and Site management Plan. The Certificate of Completion for the Site was obtained in October 2015 and Roux Associates is currently providing post-remediation monitoring services.

- Principal Engineer for a Brownfield redevelopment in Brooklyn, New York at a mixed-use multifamily housing/neighborhood retail complex with a former onsite dry cleaner under the NYSDEC BCP. There is soil, groundwater, and vapor contamination from chlorinated VOCs from the former onsite dry cleaner, as well as groundwater contamination from offsite dry cleaners. The remedy, described in the Remedial Action Work Plan prepared by Roux, consisted of hot spot soil removal, *in situ* groundwater treatment and a sub slab depressurization system for vapor mitigation in the existing buildings. The NYSDEC accepted the Final Engineering Report prepared by Roux Associates and the Site received a Certificate of Completion from NYSDEC in 2016.

- Principal Engineer for a complex dredging project for a major petroleum company on the Allegheny River in New York. The goal of the project is to remove 1,000 tons petroleum impacted sediments from the river. Work includes Site investigation, remedial investigation, alternatives evaluation, remedial design, planning and extensive regulatory permitting with multiple federal, state and local agencies.

- Principal Engineer for the alternatives evaluation, remedy selection, regulatory negotiation, preparation of design documents (drawings, specifications and permit applications) and permitting for all remedial components in support of redevelopment at a former metals manufacturing site in Staten Island, New York under the NYSDEC Voluntary Cleanup Program (VCP). The remedy included dredging and onsite disposal of stream sediments; consolidation and capping of fill material across the site; in-place abandonment of the Site's former sewer system; installation of drainage swales for storm water management; and wetland bank stabilization and mitigation/restoration. The work included a significant permitting component from multiple federal, state, and New York City regulatory agencies, including USACE, National Marine Fisheries, NYSDEC, NYSDOS, New York City Department of Environmental Protection, and Department of City Planning.

- Principal Engineer for the design, bidding, contractor selection, and remedial construction phase at a former metals manufacturing facility in Staten Island under the NYSDEC VCP. Responsibilities included finalizing biddable construction documents, issuing to bidders, preparing addenda and evaluating bids for presentation to the client. Following contractor selection Roux was heavily involved in coordinating with the client, regulators and contractor for mobilization to the site in late 2006.

209 Shafter Street | Islandia NY 11749
Main: (621) 232-2600 | Direct: (631) 630-2341
E-mail: nclarke@rouxinc.com | Website: www.rouxinc.com

Noelle M. Clarke, P.E.
Principal Engineer

During the construction Ms. Clarke provided support to the onsite construction manager regarding field changes, design revisions to account for unexpected conditions and contractor questions. The Final Engineering Report summarizing the construction activities was accepted by NYSDEC.

- Principal engineer for permitting of remedial activities at a metals manufacturing site in Staten Island, New York under the NYSDEC VCP. Required permits and regulatory approvals for the project included a Joint Permit from the USACE and NYSDEC for dredging of Mill Creek, bank stabilization and construction activities in the wetlands; a NYSDEC SPDES equivalency permit for discharge of treated water to the Arthur Kill, a New York State Department of State Coastal Management Program (CMP) Federal Consistency Assessment; a New York City Waterfront Revitalization Program Consistency Assessment, a modification of topography authorization from New York City Department of City Planning; and a New York City Department of Environmental Protection permit for temporary discharge to a combined sewer. Also required by the USACE and National Marine Fisheries, was preparation of an Essential Fish Habitat Study, in support of the Joint Permit application. Permitting activities included preparation of the various permit applications, forms and supporting documentation, as well as follow up meetings and correspondence to finalize the authorizations.

- Principal-in-Charge of an investigation and remediation project at a former petroleum refinery and current distribution facility located in Buffalo, New York. The site entered the NYSDEC BCP in 2006. Roux Associates completed the BCP application and supported the application process. The work included assessing and remediating the potential environmental impacts associated with historical Site operations. These activities have included preparing multiple work plans and directing the activities of another consultant performing the fieldwork and preparing reports of results for field investigations including soil boring and sampling, well installation and groundwater sampling, aquifer pump testing, and groundwater/separate phase modeling. An *in situ* chemical oxidation system was designed, installed and was operated as an IRM to remediate and area of free product and impacted groundwater discharging to the Buffalo River in OU-4.

- For the same petroleum Site in Buffalo, New York, multiple Alternatives Analysis Reports (to document analysis of engineering options and remedy recommendation), Remedial Action Work Plans and remedial design documents have been prepared to address the environmental impacts associated with the five Operable Units (OU) on the Site. Remedial construction for OU-1 was completed in 2007 and included excavation and disposal of impacted soil. The Final Construction Certification Report for OU-1 was accepted by the NYSDEC. The Alternatives Analysis Report and Remedial Design for OU-4 were submitted and approved by NYSDEC. The remedy for OU-4 included excavation and onsite consolidation of river sediments and site soil, stabilization of 1,400 linear feet of river embankment using tiered slopes, rip rap, and reinforced bioengineering, slurry wall groundwater containment, low permeability capping, a stormwater collection system and constructed wetland treatment for stormwater. Various vegetative measures were incorporated into the design in order to promote vegetative growth and enhance wildlife habitats. The remedial construction was completed in 2013 and 2014 and preparation of the Final Construction Completion Report was competed in 2015. The Alternatives Analysis Reports for OU-2 and OU-3 were submitted to NYSDEC. For OU-2, bench scale studies of stabilization/solidification agents were completed and evaluated for treatment of lead and petroleum impacted soil. In addition, field pilot studies of multiple options to treat petroleum impacted soils were completed and evaluated. Design of a stormwater collection system for portions of OU-2 and OU-3 was completed in 2010 and construction was completed in 2014 under the direction of Ms. Clarke.

- For the same petroleum terminal in Buffalo, New York, the work also included performing activities related to the operation of the remediation systems at the Site. These activities have included preparing a feasibility study work plan for improving water management systems at the site; preparing a work plan, directing the field work and preparing an evaluation summary report for startup and testing of a portion of the groundwater extraction system at the Site; and assisting in preparation of plans to upgrade the existing treatment facilities at the Site.

- For the same petroleum terminal in Buffalo, New York, the work also included preparation of design documents and a completion report for in-place closure of the site's former in-ground oil water separator. In addition, a vapor enhanced extraction pilot study work plan was prepared and implemented at the site for recovery of separate-phase product in one portion of the site located adjacent to the Buffalo River. The results of the VER pilot testing, along with the results of chemical oxidation pilot testing conducted at the site, have been summarized in a Remedial Action Selection report, which recommended implementation of chemical oxidation in this portion of the site. A conceptual plan for implementation of chemical oxidation was submitted with the selection document. The work also included maintaining contact with regulatory agencies regarding the status of activities at the Terminal; preparing compliance monitoring reports for submittal to

209 Shafter Street | Islandia NY 11749
Main: (621) 232-2600 | Direct: (631) 630-2341
E-mail: nclarke@rouxinc.com | Website: www.rouxinc.com

the regulatory agencies; overall project coordination; and budget management and tracking.

- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a 4-acre former oil terminal in Cold Spring Harbor, New York under the NYSDEC spills program. The remedy completed included excavation and offsite disposal of approximately 20,000 tons of petroleum contaminated and/or hazardous lead contaminated soil in accordance with the future use of the site under an Environmental Easement. Additional activities completed by Roux at the site included asbestos remediation followed by building demolition, UST removal, and cesspool remediation. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.
- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a portion of a former oil terminal in Sag Harbor, New York. The remedy completed included excavation and offsite disposal of approximately 2,000 tons of petroleum contaminated soil from beneath an active public roadway under the NYSDEC spills program. The remedy included extensive traffic control and coordination with Village of Sag Harbor officials, dewatering, water treatment, temporary water discharge of treated water to Sag Harbor and restoration of the public roadway in accordance with the Village of Sag Harbor Department of Public Works requirements. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site. Project Manager for preparation of a work plan, direction the field activities and preparation of a summary report for investigation of the storm-water collection system at a petroleum terminal in Buffalo, New York. The objectives of the storm sewer investigation were to: prepare a detailed map of the Site's sewer system; re-establish connections that may have become blocked by debris; investigate the structural integrity of the storm sewers; locate areas of groundwater infiltration and assess infiltration rate and quality; assess wet and dry-weather flow and quality; and identify areas contributing surface water to the collection system, including hydrologic modeling using TR-55. Based on the results of the investigation, several improvements to the sewer system were recommended, including eliminating inlets to the system in areas of the site where no active operations currently take place and rehabilitation and/or installation of new sewers to restore flow by gravity to the treatment system.
- Principal Engineer for the investigation, remedial design, construction oversight and operation and maintenance of a bioventing and soil vapor extraction system at the Site of a diesel UST failure in Brooklyn. A free product recovery system was also designed, installed, and operated by Roux. Investigation activities included the use of the sonic drilling technique to advance twelve wells to 85 feet below grade through cobbles and boulders for delineation of separate phase product, soil and groundwater impacts. Eight wells were converted to combination biovent/SVE wells. Design included specification of SVE and biovent blowers, piping, valves, and an automatic control system. Product only pumps were also designed and installed in three wells. Approximately 2,000 gallons of product were recovered to by the two systems and the spill was closed by NYSDEC in 2011.
- Principal Engineer for a Brownfield redevelopment in Staten Island, New York of a former retail service station site under the NYSDEC BCP. There is soil, groundwater and vapor contamination from petroleum-related constituents in the vicinity of the former gasoline piping and pump island (the petroleum source area), as well as historic fill across the entire site. The remedy, described in the Remedial Action Work Plan prepared by Roux, will consist of a sheet pile containment wall around the petroleum source area, a Site Cover System across the entire site, comprised of concrete building slab/walkways, asphalt parking areas and limited landscaped areas and site-wide a sub-slab depressurization system to prevent vapor intrusion into the proposed retail building and offsite migration of impacted soil vapor. A certificate of completion from NYSDEC was obtained in 2020.
- Project Manager for the remedial design at a Superfund Site in Nanuet, New York for the New York State Department of Environmental Conservation. The work included preparation of a preliminary design report, which evaluated two alternatives for handling hazardous soils and sediments at the site contaminated with volatile organic compounds. Each alternative was evaluated on the basis of technical feasibility, cost and schedule for implementation. Based upon this evaluation, off-site disposal was recommended over on-site treatment. The report presented a site-wide conceptual plan for remediation, including soil/sediment excavation, staging and sampling; stream diversion; excavation dewatering; temporary on-site groundwater treatment; and long term monitoring. Duties also included managing and tracking all project budgets and serving as the main client contact.
- Principal Engineer for the design and specification of a large-scale (750 scfm) soil vapor extraction (SVE) pilot system with thermal oxidation off-gas treatment for a client in Brazil. Responsibilities included equipment sizing and specification, selection of materials of construction, SVE well and equipment layout, description of general startup procedures and preparation of a pilot test work plan. The pilot test work plan included a description of the pilot test operating procedures to be followed, operating parameters to be monitored and data to be collected and analyzed. The work also included

209 Shafter Street | Islandia NY 11749
Main: (621) 232-2600 | Direct: (631) 630-2341
E-mail: nclarke@rouxinc.com | Website: www.rouxinc.com

conducting the pilot test activities and generating a report that included plans for expanding the SVE system across the Site. The work currently also included technical support for evaluating and optimizing system performance.

- Project Manager for a storm sewer study at the former metals manufacturing facility in Staten Island, New York as part of the Voluntary Cleanup Program for the Site to identify contaminated infiltration sources, provide an accurate site drainage map, and verify contributing areas to each outfall. The investigation included field inspections, surveying, dye testing, and sampling during varying tidal conditions. The storm sewer map prepared was used for future sewer closure and site redevelopment planning.
- Principal engineer for the design of a new storm water collection system for a metals manufacturing site in Staten Island, New York under the NYSDEC VCP. The design included evaluation and hydrologic modeling of the system using the U.S.g Soil Conservation Service TR-55 hydrologic analysis model, inlet structure and pipe sizing and layout, outfall design and specification of materials and methods of construction for all system components.
- Principal-in-Charge of the operation, maintenance, monitoring and reporting activities at multiple active and former petroleum storage and distribution terminals located in New York for a large petroleum company. The work includes operation, maintenance, and performance/ compliance monitoring services at the sites that currently have active remediation system installed and monitoring, sampling, and reporting services at sites without systems. The remediation systems include groundwater extraction and treatment, free product recovery, bio-sparging, and soil vapor extraction/air sparging. At these sites, Roux Associates is responsible for: maintaining and troubleshooting the various system components to reduce downtime to the extent possible; repairing and/or replacing equipment as needed; coordinating the upgrading of the electrical systems, as needed, to meet current building code requirements; expanding systems to meet regulatory requirements, as needed; optimizing system performance; collecting performance monitoring samples and data to track the efficiency of the treatment systems; and collecting compliance monitoring data.
- Principal Engineer for at multiple petroleum terminals in New York State for groundwater quality and surface water quality sampling and monitoring well gauging as required by the New York State Department of Environmental Conservation, as well as quarterly reporting for all sites. The work has also included collection of soil quality data at several sites and performance of an electromagnetic survey to support the divestiture and redevelopment of one of these sites. Based on these results, soil removal activities were performed at one of the former terminals in order to obtain regulatory closure of the site. Roux Associates successfully completed the remedial activities to the satisfaction of the regulator and received closure for the client of the open spill number. Regulatory closure of another of these former terminals was obtained based upon the results of ongoing groundwater monitoring and reporting.
- Project Engineer for design of a 2.6-mgd groundwater treatment system at the Fireman's Training Center for Nassau County Department of Public Works on Long Island. The work included design of air strippers, exhaust stacks, liquid-phase GAC treatment units, and all chemical feed and storage facilities, including unit sizing, selection of materials of construction, equipment layout, and coordination with other disciplines. The work also included development of the "mass balance" for the facility.
- Task leader in charge of overseeing a bioventing pilot study conducted by a subconsultant, to treat contaminated vadose zone soils at the Fireman's Training Center site in Nassau County, New York. The work included development of a preliminary design report for the full-scale implementation of bioventing at the site based upon the results of the pilot study.
- Project Engineer for the design, specification, construction and operation of an air sparging and soil vapor extraction pilot at the Long Island terminal of a large petrochemical distributor. The pilot was designed to treat contaminated ground water and vadose zone soils resulting from a one-million-gallon gasoline spill at the site. The work included development of the field sampling program and sampling and evaluation of various parameters to determine the pilot's radius of influence and effectiveness. The work also included performing data analysis and preparation of the pilot study report, which recommended full scale implementation of air sparging at the site. The site-wide implementation of air sparging and expansion of the site's existing vapor extraction system at the same Long Island petrochemical terminal was also part of the work. Responsibilities included design, specification, and layout of all mechanical equipment, vapor extraction, and air sparging wells and new vapor extraction/air sparging piping.
- Task leader responsible for investigating alternatives for the treatment of gasoline contaminated off-gas from air stripping operations a Long Island petrochemical terminal. Based on this evaluation, biofiltration was selected for piloting. Responsibilities included design of a pilot unit; development of sampling and data collection procedures; construction oversight and "troubleshooting" for the unit; coordination of data collection activities; and compilation and analysis of the pilot data.

209 Shafter Street | Islandia NY 11749
Main: (621) 232-2600 | Direct: (631) 630-2341
E-mail: nclarke@rouxinc.com | Website: www.rouxinc.com

Noelle M. Clarke, P.E.
Principal Engineer

- Project Engineer for the design of a 0.50-mgd groundwater treatment facility a Long Island petrochemical terminal. Responsibilities included the design, specification, and layout of mechanical equipment, including the air stripping tower, vapor phase granular activated carbon off-gas treatment, centrifugal blowers, ductwork, influent pump, and concrete wet well. Responsible for shop drawing review during the construction phase.
- Project Manager for an investigation at a gasoline service station with soil and groundwater contamination. Responsible for reviewing and evaluating the work of another consultant that performed the soil and groundwater sampling and conducted remedial activities at the site including: investigation summary reports; remedial designs; remediation progress reports; correspondence with regulators; and plans for future work at the Site. The work also included mapping the groundwater flow patterns in the area of the service station and mapping the areal and vertical extent of the groundwater contamination. Responsible for project coordination and budget management and tracking.
- Project Manager for the field investigation, feasibility evaluation, and remedial design at Superfund Site in Spring Valley, New York for the New York State Department of Environmental Conservation. The work included development of a work plan and site operations plan. The field investigations included Geoprobe soil borings; groundwater monitoring well installation; groundwater sampling; aquifer pump testing; and vapor extraction pilot testing. Work also included conducting the field operations for the vapor extraction pilot and producing a summary report of the field investigation results. The report presented an evaluation of the cost and feasibility of several alternatives for remediation of the site. It recommended reducing the level of effort of the remediation presented in the Record of Decision, based on lower levels of contamination encountered during the investigation. Duties also included project coordination; budget management and tracking; and development of subcontract agreements.
- Project Engineer for upgrades to the Spring Creek Auxiliary Water Pollution Control Plant for the City of New York. The work included the evaluation, design, and specification of a two-stage odor control system, chemical storage and feed facilities and new effluent disinfection system.
- Project Engineer responsible for preparation of design documents for the replacement of the sodium hypochlorite pumps and piping at the Mamaroneck Wastewater Treatment Plant for Westchester County Department of Environmental Facilities in New York.
- Project Engineer for design of upgrades to the New Rochelle Wastewater Treatment Facility for Westchester Count Department of Environmental Facilities in New York. Designed upgrades to the main influent pump station, including rehabilitation of the existing influent pumps and replacement of the magnetic drives with new variable frequency drives. Responsibilities also included design of a submersible automatic duplex sump pump system, new primary sludge pumps and piping and new primary and secondary settling tank equipment. The work also included assisting the County during the bidding and contractor selection phase and preparing addenda to the contract documents.
- Project Manager for the construction of upgrades to the New Rochelle Wastewater Treatment Facility. Responsibilities included overseeing the shop drawing logging and distribution process; reviewing mechanical equipment shop drawings; addressing contractor questions regarding the contract documents; and coordinating with the resident engineer in the field and the electrical and general contractors.
- Project Engineer for the performance evaluation of the Harriman Wastewater Treatment Plant for the Orange County Department of Environmental Facilities and Services. Responsibilities included documentation of the existing conditions at the plant and evaluation of the historical and current performance of the plant with respect to its potential for expansion. A summary report was prepared, which included evaluations of the existing plant processes with respect to standard design criteria, typical design practices and receiving water considerations. This summary report served as the basis for the facilities plan prepared as the next phase of the project.
- Project Engineer for the facilities plan for the upgrade of the Harriman Wastewater Treatment Plant. Responsibilities included evaluation of alternatives for expanding the plant's treatment capacity. A report was prepared, which recommended the conversion of the existing oxidation ditches to sequencing batch reactors (SBR) in order to increase the plant's treatment capacity to 6.0 mgd within the limited space available on the site.
- Project Engineer for the Gates-Chili-Ogden Pump Station and Force main design for Monroe County, New York. The design consisted of a new 36 mgd wet pit/dry pit pump station, influent sewer and force main. Responsibilities included evaluating influent pumping conditions, and design of the influent sewer, manual influent bar racks and a duplex automatic submersible sump pump system for the station.

209 Shafter Street | Islandia NY 11749
Main: (621) 232-2600 | Direct: (631) 630-2341
E-mail: nclarke@rouxinc.com | Website: www.rouxinc.com

ROUX

PROFESSIONAL PROFILE

Jessica L. Taylor, P.G.
Principal Hydrogeologist

TECHNICAL SPECIALTIES

Project Management and Field Management for large-scale soil excavation and remediation projects, including site assessment, remediation implementation, and construction activities. Negotiation with NYSDEC Brownfield Cleanup Program (BCP) and NYCOER E-Designation/Voluntary Cleanup Program. Coordination and management of large-scale demolition and renovation support. Performance of sampling and direction of field sampling teams for the following media: soil, groundwater, surface water, soil vapor, sludge, and sediment. Excavation sampling and oversight and waste tracking.

EXPERIENCE SUMMARY

Fifteen years of experience: Principal, Senior, Project, and Staff Hydrogeologist, Roux Environmental Engineering and Geology, D.P.C., Islandia, New York; Staff Hydrogeologist and Intern at GSC|Kleinfelder.

CREDENTIALS

B.S. Geology, Binghamton University, 2005
Professional Geologist, New York, 2017
OSHA 40-Hour HAZWOPER Training, 2005
OSHA 10-Hour Construction Safety Training, 2008

KEY PROJECTS

- Project Principal for a large on-going redevelopment project in Brooklyn, New York, including four buildings with E-Designations. The project encompasses 22 acres including the Barclays Center. Project includes coordination and oversight of *in situ* waste characterization sampling, excavation, and proper disposal of soil. Coordination of pre-demolition asbestos and hazardous materials surveys. Construction management and support for excavation of 500,000 CY of soil; environmental support for demolition and relocating of an active nine-acre 100-year old rail yard. Responsible for implementing and managing remediation work at several NYSDEC spill sites within the project footprint, including *in situ* chemical oxidation, UST removal, and soil excavation. Agency support for NYSDEC, NYCDEP, NYCOER, MTA (LIRR/NYCT), and ESDC.
- Project Principal for remediation of two parcels in Queens, New York as part of NYSDEC Brownfield Cleanup Program. This project included due-diligence environmental assessment and investigation, development of NYSDEC-approved Remedial Investigation Work Plan and Remedial Action Work Plan, and remediation during construction of two mixed-use, affordable housing developments. Also required coordination with NYCHPD and NYCDEP to meet regulatory requirements for funding.
- Project Principal for remediation of a 0.66-acre parcel in Brooklyn, New York as part of NYSDEC Brownfield Cleanup Program. This project included due-diligence environmental assessment and investigation, development of NYSDEC-approved RIWP and RAWP including an active sub-slab depressurization system, and remediation during construction of a mixed-use affordable housing developments including full cellar. Also required coordination with NYCHPD and NYCDEP to meet regulatory requirements for funding.
- Project Principal for management of E-Designation during excavation and construction of a hotel/residential building in Manhattanville, including management of waste characterization and disposal of 16,000 CY of soil.
- Project Principal for redevelopment of four properties in Brooklyn, with NYCOER to address NYCDEP E-Designations. Coordination with NYCOER to implement remedial investigation and develop RAP as part of the NYC VCP.
- Senior Project Manager for the environmental management of asbestos remediation during the renovation of Nassau Coliseum, Uniondale, New York. Responsible for coordinating inspections and delineation of ACM, preparing budgetary estimates, and bid support for full abatement. Also includes management of decommissioning and replacement of existing emergency generator UST.
- Project Manager for commercial redevelopment site in the Bronx, including *in situ* waste characterization, management and coordination of excavation, community air monitoring, and development of NYCDEP-approved RAP.
- Client liaison and full-time onsite construction manager at redevelopment site in Rego Park, New York. Collection of 500 *in situ* waste characterization soil samples, oversight of 250,000 cubic yards of soil excavation and remediation, development of post-remediation sampling plan, organization of waste manifests and hazardous waste documents to ensure proper disposal. Coordination of daily site activities with multiple construction contractors and other involved parties on behalf of client. Oversight and confirmatory soil sampling for on-site treatment of 75,000 cubic yards of hazardous lead contaminated soil.
- Project and Field Manager for multiple Phase I and Phase II ESAs of retail gasoline stations in New York and New Jersey. This includes drilling and sampling oversight and health and safety management, as well as writing Phase II ESA reports for over 40 sites.

209 Shafter Street | Islandia, NY 11749
Main: (631) 232-2600 | Direct: (631) 630-2395
E-mail: jtaylor@rouxinc.com | Website: http://www.rouxinc.com

ROUX

PROFESSIONAL PROFILE

Valerie Sabatasso

Project Scientist

TECHNICAL SPECIALTIES

Design, implementation, and management of Remedial Investigations and Remedial Actions for sites in regulatory programs including United States Environmental Protection Agency Superfund program, New York State Brownfields Cleanup Program, and New York City Office of Environmental Remediation Voluntary Cleanup Program; Management of due diligence Phase I & II Environmental Site Assessments; Preparation and management of Remedial Investigation Work Plans, Remedial Investigation Reports, Remedial Action Work Plans, and Remedial Action Reports; Investigation and evaluation of petroleum-related contamination and per- and poly fluoroalkyl substances (PFAS)-related contamination; Management of Environmental Site Assessments focusing on soil, groundwater, and soil vapor investigations. Performance of sampling for the following media: soil, groundwater, surface water, soil vapor, and sediment.; and Excavation sampling and oversight and waste tracking.

EXPERIENCE SUMMARY

Six years of experience: Project and Staff Scientist at Roux Environmental Engineering and Geology, D.P.C.

CREDENTIALS

B.S. Physics, Stony Brook University, 2014

OSHA 40-hour HAZWOPER Training, 2015

OSHA 30-hour Construction Safety Training, 2019

OSHA 8-hour Refresher Training, 2016 - 2019

OSHA 10-hour Construction Safety Training, 2015

First Aid and CPR Certified

Transportation Worker Identification Credential (TWIC)

Loss Prevention System (LPS) Awareness, 8-Hour Certified

MTA LIRR Roadway Worker Protection Training

KEY PROJECTS

- Project Manager for the ongoing large scale excavation of a former airport long-term parking lot in Queens, New York. Redevelopment includes a unique, large-scale warehouse meant to ease transportation of goods for the airport. The project is enrolled in the NYC OER VCP, which has transferred over 70,000 CY, most of which has been through the Clean Soil Bank, and will obtain a Track 1 Cleanup. Management of excavation oversight has included remediation for the closure of 28 drywells, nonfibrous asbestos abatement, and the removal of three unregistered USTs discovered during excavation.
- Project Manager for a series of clusters of sites across East New York and the Bronx, New York. Currently, seven Phase I ESAs and eight Phase II ESAs have been completed have been completed. A RAWP is being completed for one of the properties, which has an E designation and is under guidance of the NYC OER.
- Project Manager for an affordable housing redevelopment site under NYCDEP guidance in Bronx, New York. This project included a due diligence environmental investigation; remedial investigations (soil, groundwater, and soil vapor); site-wide *in situ* waste characterization sampling program; a Remedial Action Work Plan, the management of soil and bedrock excavation, and a Remedial Closure Report.
- Project Manager for the ongoing remediation of over 20 drywell structures at a strip mall facility in Setauket, New York. The drywell remediation project was conducted in accordance with the Suffolk County Article XII requirements and entailed coordination with Suffolk County Department of Health Services (SCDHS).
- Project Manager for remedial investigation at a former gas station located in Brooklyn, New York. Historical site operations adversely affected the subsurface through petroleum hydrocarbon impacts. Responsibilities included creating and managing an initial sample plan for soil and groundwater, designing a remediation plan that included a small scale excavation and the use of RegenOx™ oxygen-releasing pellets, and maintaining communication between subcontractors.
- Field Manager for the installation of over 400 points for a Vapor Mitigation System in an active warehouse in New Jersey. Responsible for semi-annual indoor air sampling consisting of 130 air samples collected following each tenant's specific schedule as well as consistent SSDS monitoring to ensure the system is running correctly and efficiently.
- Project Manager for underground storage tank (UST) discovery, inventory, and removal. Field responsibilities involved subcontractor oversight for excavation and removal of UST, tank cleaning, and waste management.
- Field Manager responsible for implementation of a remedial investigation at a former Manufactured Gas Plant (MGP) site in Brooklyn, New York. Tasks included management of remedial

209 Shafter Street | Islandia, NY 11749
Main: (631) 232-2600 | Direct: (631) 630-2364
E-mail: vsabatasso@rouxinc.com | Website: http://www.rouxinc.com

Valerie Sabatasso

Project Scientist

investigation, collection of forensic samples, and management of on-site Health and Safety.

- Staff Scientist as a former alumina manufacturing facility in Corpus Christi, Texas. Tasks included intrusive site investigation, health and safety management, collection of samples for laboratory analysis from various media including soil, sediment, surface water, and groundwater, and completion of pH tests of surface water above 13 pH. Areas of concern being addressed by the investigation included the manufacturing area, wastewater percolation ponds, on-site landfills, and various surface water features.
- Performed numerous Phase I Environmental Site Assessments for due diligence in connection with property transfers for the Metro New York Area. Most properties included commercial properties, former automobile service stations, and residential/office buildings.
- Field manager responsible for soil excavation and waste removal oversight for development of residential buildings in Brooklyn, New York. Responsibilities included overseeing excavation, organization and proper handling of waste manifests and ensuring compliance with the Site Environmental Management Plan.
- Field Manager responsible for implementation of Remedial Investigation Work Plan (RIWP) at an industrial warehouse in Brooklyn, New York that is currently being developed for residential apartments. Responsible for groundwater level monitoring which included recording, entering, and reviewing data with in Situ electronic transducers.
- Field manager responsible for implementation of Community Air Monitoring Plan (CAMP) during excavation at a hospital in Greenwich Village, New York. Monitored airborne dust and VOCs that are potentially generated by remedial action work activities, reviewing the collected data for exceedances of the New York State Department of Health (NYSDOH) guidelines. Intrusive activities included removing concrete and rebar and backfilling with clean soil. In addition to CAMP activities, assisted project engineer and construction manager with contractor oversight, material review, health and safety oversight, and daily reporting.
- Staff Scientist responsible for Phase II Site Assessment and preparation of investigation reports for soil boring installation, monitoring well installation and corresponding soil, soil vapor, and groundwater sampling.
- Project execution manager for various projects at multiple locations in Manhattan, the Bronx, Staten Island, Queens, and Brooklyn, New York. Activities including: subcontractor coordination, scheduling, bottleware and sample management, subcontractor contract preparation, scope of work project design, subcontractor oversight, system operations and maintenance, tenant relations, and health and safety management.
- Site Safety Officer for various remedial investigation sites. Responsibilities include preparation of health and safety plans (HASPs), job safety analysis (JSA) documents development and review, onsite safety meeting management, safety document preparation (Lessons Learned, Near Loss, Field Audits, etc.), and planning/execution of corrective actions.

209 Shafter Street | Islandia, NY 11749
Main: (631) 232-2600 | Direct: (631) 630-2364
E-mail: vsabatasso@rouxinc.com | Website: http://www.rouxinc.com

ATTACHMENT 2

NYSDEC January 2021 PFAS Sampling Guidance

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Under NYSDEC's Part 375 Remedial Programs

January 2021

Table of Contents

ERRATA SHEET for

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) Under NYSDEC's Part 375 Remedial Programs Issued January 17, 2020

Citation and Page Number	Current Text	Corrected Text	Date
Title of Appendix I, page 32	Appendix H	Appendix I	2/25/2020
Document Cover, page 1	Guidelines for Sampling and Analysis of PFAS	Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs	9/15/2020
Routine Analysis, page 9	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1 or ISO 25101."	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533."	9/15/2020
Additional Analysis, page 9, new paragraph regarding soil parameters	None	"In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (EPA Method 9060), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils."	9/15/2020
Data Assessment and Application to Site Cleanup Page 10	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFAS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Target levels for cleanup of PFAS in other media, including biota and sediment, have not yet been established by the DEC.	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Water Sample Results Page 10	PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water (…) If PFAS are identified as a contaminant of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water (…) If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	9/15/2020
Soil Sample Results, page 10	"The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase."	"Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values. " [Interim SCO Table] "PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP. As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf. "	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Testing for Imported Soil Page 11	Soil imported to a site for use in a soil cap, soil cover, or as backfill is to be tested for PFAS in general conformance with DER-10, Section 5.4(e) for the PFAS Analyte List (Appendix F) using the analytical procedures discussed below and the criteria in DER-10 associated with SVOCs. If PFOA or PFOS is detected in any sample at or above 1 µg/kg, then soil should be tested by SPLP and the leachate analyzed for PFAS. If the SPLP results exceed 10 ppt for either PFOA or PFOS (individually) then the source of backfill should be rejected, unless a site-specific exemption is provided by DER. SPLP leachate criteria is based on the Maximum Contaminant Levels proposed for drinking water by New York State's Department of Health, this value may be updated based on future Federal or State promulgated regulatory standards. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable. PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Footnotes	None	[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances. [2] The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the soil cleanup objective for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	9/15/2020
Additional Analysis, page 9	In cases… soil parameters, such as Total Organic Carbon (EPA Method 9060), soil…	In cases… soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil…	1/8/2021
Appendix A, General Guidelines, fourth bullet	List the ELAP-approved lab(s) to be used for analysis of samples	List the ELAP- certified lab(s) to be used for analysis of samples	1/8/2021
Appendix E, Laboratory Analysis and Containers	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by ISO Method 25101.	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101	1/8/2021

Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis, reporting, and assessment of PFAS, DER has developed this document which summarizes currently accepted procedures and updates previous DER technical guidance pertaining to PFAS.

Applicability

All work plans submitted to DEC pursuant to one of the remedial programs under Part 375 shall include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day per site or one per twenty samples, whichever is more frequent.

Analysis and Reporting

As of October 2020, the United States Environmental Protection Agency (EPA) does not have a validated method for analysis of PFAS for media commonly analyzed under DER remedial programs (non-potable waters, solids). DER has developed the following guidelines to ensure consistency in analysis and reporting of PFAS.

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third party data validator. Electronic data submissions should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

DER has developed a *PFAS Analyte List* (Appendix F) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP) does not offer certification for PFAS in matrices other than finished drinking water. However, laboratories analyzing environmental samples for PFAS (e.g., soil, sediments, and groundwater) under DER's Part 375 remedial programs need to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533. Laboratories should adhere to the guidelines and criteria set forth in the DER's laboratory guidelines for PFAS in non-potable water and solids (Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids). Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

LC-MS/MS analysis for PFAS using methodologies based on EPA Method 537.1 is the procedure to use for environmental samples. Isotope dilution techniques should be utilized for the analysis of PFAS in all media. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 µg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist.

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay).

In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated

if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology.[1]

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Data Assessment and Application to Site Cleanup

Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.

Water Sample Results

PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water if PFOA or PFOS is detected in any water sample at or above 10 ng/L (ppt) and is determined to be attributable to the site, either by a comparison of upgradient and downgradient levels, or the presence of soil source areas, as defined below. In addition, further assessment of water may be warranted if either of the following screening levels are met:

a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or
b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L

If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values.

Guidance Values for Anticipated Site Use	PFOA (ppb)	PFOS (ppb)
Unrestricted	0.66	0.88
Residential	6.6	8.8
Restricted Residential	33	44
Commercial	500	440
Industrial	600	440
Protection of Groundwater[2]	1.1	3.7

[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.
[2] The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).

PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP.

As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf.

Testing for Imported Soil

Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable.

PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.

Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

General Guidelines in Accordance with DER-10

- Document/work plan section title – Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
    - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP certified lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an "Analytical Methods/Quality Assurance Summary Table" specifying:
    - Matrix type
    - Number or frequency of samples to be collected per matrix
    - Number of field and trip blanks per matrix
    - Analytical parameters to be measured per matrix
    - Analytical methods to be used per matrix with minimum reporting limits
    - Number and type of matrix spike and matrix spike duplicate samples to be collected
    - Number and type of duplicate samples to be collected
    - Sample preservation to be used per analytical method and sample matrix
    - Sample container volume and type to be used per analytical method and sample matrix
    - Sample holding time to be used per analytical method and sample matrix
- Specify Category B laboratory data deliverables and preparation of a DUSR

Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by LC-MS/MS for PFAS using methodologies based on EPA Method 537.1
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
- Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101
- Include detailed sampling procedures
    - Precautions to be taken
    - Pump and equipment types
    - Decontamination procedures
    - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per site for each matrix

Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

General

The objective of this protocol is to give general guidelines for the collection of soil, sediment and other solid samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Containers

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel spoon
- stainless steel bowl
- steel hand auger or shovel without any coatings

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a pre-cleaned trowel or shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) should then be collected using a pre-cleaned, stainless steel spoon. Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a pre-cleaned hand auger or shovel. When the desired subsurface depth is reached, a pre-cleaned hand auger or spoon shall be used to obtain the sample.

When the sample is obtained, it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized. At this point the material within the bowl can be placed into the laboratory provided container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix C - Sampling Protocols for PFAS in Monitoring Wells

General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel inertia pump with HDPE tubing
- peristaltic pump equipped with HDPE tubing and silicone tubing
- stainless steel bailer with stainless steel ball
- bladder pump (identified as PFAS-free) with HDPE tubing

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Monitoring wells should be purged in accordance with the sampling procedure (standard/volume purge or low flow purge) identified in the site work plan, which will determine the appropriate time to collect the sample. If sampling using standard purge techniques, additional purging may be needed to reduce turbidity levels, so samples contain a limited amount of sediment within the sample containers. Sample containers that contain sediment may cause issues at the laboratory, which may result in elevated reporting limits and other issues during the sample preparation that can compromise data usability. Sampling personnel should don new nitrile gloves prior to sample collection due to the potential to contact PFAS containing items (not related to the sampling equipment) during the purging activities.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Additional equipment blank samples may be collected to assess other equipment that is utilized at the monitoring well
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A purge log shall document the location of the sample, sampling equipment, groundwater parameters, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix D - Sampling Protocols for PFAS in Surface Water

General

The objective of this protocol is to give general guidelines for the collection of surface water samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel cup

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

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

If site conditions permit, samples can be collected directly into the laboratory container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A sample log shall document the location of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

General

The objective of this protocol is to give general guidelines for the collection of water samples from private water supply wells (with a functioning pump) for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101. The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials (e.g. plumbers tape), including sample bottle cap liners with a PTFE layer.

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., washroom sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- If equipment was used, collect one equipment blank per day per site and a minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers.
- A field reagent blank (FRB) should be collected at a rate of one per 20 samples. The lab will provide a FRB bottle containing PFAS free water and one empty FRB bottle. In the field, pour the water from the one bottle into the empty FRB bottle and label appropriately.
- Request appropriate data deliverable (Category B) and an electronic data deliverable
- For sampling events where multiple private wells (homes or sites) are to be sampled per day, it is acceptable to collect QC samples at a rate of one per 20 across multiple sites or days.

Documentation

A sample log shall document the location of the private well, sample point location, owner contact information, sampling equipment, purge duration, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate and available (e.g. well construction, pump type and location, yield, installation date). Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the latest guidelines developed by the Division of Fish and Wildlife (DFW) entitled “General Fish Handling Procedures for Contaminant Analysis” (Ver. 8).

Procedure Name: General Fish Handling Procedures for Contaminant Analysis

Number: FW-005

Purpose: This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

Organization: Environmental Monitoring Section
Bureau of Ecosystem Health
Division of Fish and Wildlife (DFW)
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233-4756

Version: 8

Previous Version Date: 21 March 2018

Summary of Changes to this Version: Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

Originator or Revised by: Wayne Richter, Jesse Becker

Date: 26 April 2019

Quality Assurance Officer and Approval Date: Jesse Becker, 26 April 2019

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:

   1. The top box is to be filled out **and signed** by the person responsible for the fish collection (e.g., crew leader, field biologist, researcher). This person is responsible for delivery of the samples to DEC facilities or personnel (e.g., regional office or biologist).

   2. The second section is to be filled out **and signed** by the person responsible for the collections while being stored at DEC, before delivery to the analytical lab. This may be the same person as in (1), but it is still required that they complete the section. Also important is the **range of identification numbers** (i.e., tag numbers) included in the sample batch.

   3. Finally, the bottom box is to record any transfers between DEC personnel and facilities. Each subsequent transfer should be **identified, signed, and dated**, until laboratory personnel take possession of the fish.

B. The following data are required on each **Fish Collection Record** form:

   1. Project and Site Name.

   2. DEC Region.

   3. All personnel (and affiliation) involved in the collection.

   4. Method of collection (gill net, hook and line, etc.)

   5. Preservation Method.

C. The following data are to be taken on each fish collected and recorded on the **Fish Collection Record** form:

   1. Tag number - Each specimen is to be individually jaw tagged at time of collection with a unique number. Make sure the tag is turned out so that the number can be read without opening the bag. Use tags in sequential order. For small fish or composite samples place the tag inside the bag with the samples. The Bureau of Ecosystem Health can supply the tags.

   2. Species identification (please be explicit enough to enable assigning genus and species). Group fish by species when processing.

   3. Date collected.

   4. Sample location (waterway and nearest prominent identifiable landmark).

   5. Total length (nearest mm or smallest sub-unit on measuring instrument) and weight (nearest g or

smallest sub-unit of weight on weighing instrument). Take all measures as soon as possible with calibrated, protected instruments (e.g. from wind and upsets) and prior to freezing.

6. Sex - fish may be cut enough to allow sexing or other internal investigation, but do not eviscerate. Make any incision on the right side of the belly flap or exactly down the midline so that a left-side fillet can be removed.

D. General data collection recommendations:

1. It is helpful to use an ID or tag number that will be unique. It is best to use metal striped bass or other uniquely numbered metal tags. If uniquely numbered tags are unavailable, values based on the region, water body and year are likely to be unique: for example, R7CAY11001 for Region 7, Cayuga Lake, 2011, fish 1. If the fish are just numbered 1 through 20, we have to give them new numbers for our database, making it more difficult to trace your fish to their analytical results and creating an additional possibility for errors.

2. Process and record fish of the same species sequentially. Recording mistakes are less likely when all fish from a species are processed together. Starting with the bigger fish species helps avoid missing an individual.

3. If using Bureau of Ecosystem Health supplied tags or other numbered tags, use tags in sequence so that fish are recorded with sequential Tag Numbers. This makes data entry and login at the lab and use of the data in the future easier and reduces keypunch errors.

4. Record length and weight as soon as possible after collection and before freezing. Other data are recorded in the field upon collection. An age determination of each fish is optional, but if done, it is recorded in the appropriate “Age” column.

5. For composite samples of small fish, record the number of fish in the composite in the Remarks column. Record the length and weight of each individual in a composite. All fish in a composite sample should be of the same species and members of a composite should be visually matched for size.

6. Please submit photocopies of topographic maps or good quality navigation charts indicating sampling locations. GPS coordinates can be entered in the Location column of the collection record form in addition to or instead for providing a map. These records are of immense help to us (and hopefully you) in providing documented location records which are not dependent on memory and/or the same collection crew. In addition, they may be helpful for contaminant source trackdown and remediation/control efforts of the Department.

7. When recording data on fish measurements, it will help to ensure correct data recording for the data recorder to call back the numbers to the person making the measurements.

E. Each fish is to be placed in its own individual plastic bag. For small fish to be analyzed as a composite, put all of the fish for one composite in the same bag but use a separate bag for each composite. It is important to individually bag the fish to avoid difficulties or cross contamination when processing the fish for chemical analysis. Be sure to include the fish’s tag number inside the bag, preferably attached to the fish with the tag number turned out so it can be read. Tie or otherwise secure the bag closed. **The Bureau of Ecosystem Health will supply the bags.** If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with

the same information.

F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. **The Bureau of Ecosystem Health will supply the larger bags.** Tie or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and **tag number ranges**. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.

G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.

H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:

No materials containing Teflon.
No Post-it notes.
No ice packs; only water ice or dry ice.
Any gloves worn must be powder free nitrile.
No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).
No stain repellent or waterproof treated clothing; these are likely to contain PFCs.
Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.
Wash hands after handling any food containers or packages as these may contain PFCs.
Keep pre-wrapped food containers and wrappers isolated from fish handling.
Wear clothing washed at least six times since purchase.
Wear clothing washed without fabric softener.
Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with “fluor” in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.

I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C ± 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.

J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.

K. A recommended equipment list is at the end of this document.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH AND WILDLIFE
FISH COLLECTION RECORD

Project and Site Name _____ DEC Region _____

Collections made by (include all crew) _____

Sampling Method: □Electrofishing □Gill netting □Trap netting □Trawling □Seining □Angling □Other _____

Preservation Method: □Freezing □Other _____ Notes (SWFDB survey number): _____

FOR LAB USE ONLY- LAB ENTRY NO.	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT	LENGTH ( )	WEIGHT ( )	REMARKS

richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CHAIN OF CUSTODY

I, _____, of _____ collected the
(Print Name) (Print Business Address)

following on _____, 20____ from _____
(Date) (Water Body)

in the vicinity of _____
(Landmark, Village, Road, etc.)

Town of _____, in _____ County.

Item(s) _____

_____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on _____, 20_____.

_____ _____
Signature Date

I, _____, received the above mentioned sample(s) on the date specified and assigned identification number(s) _____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

_____ _____
Signature Date

SECOND RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
THIRD RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
FOURTH RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
RECEIVED IN LABORATORY BY (Print Name)	TIME & DATE	REMARKS
SIGNATURE	UNIT	
LOGGED IN BY (Print Name)	TIME & DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

richter: revised 21 April 2014; becker: 23 March 2017, 26 April, 2019

NOTICE OF WARRANTY

By signature to the chain of custody (reverse), the signatory warrants that the information provided is truthful and accurate to the best of his/her ability. The signatory affirms that he/she is willing to testify to those facts provided and the circumstances surrounding the same. Nothing in this warranty or chain of custody negates responsibility nor liability of the signatories for the truthfulness and accuracy of the statements provided.

HANDLING INSTRUCTIONS

On day of collection, collector(s) name(s), address(es), date, geographic location of capture (attach a copy of topographic map or navigation chart), species, number kept of each species, and description of capture vicinity (proper noun, if possible) along with name of Town and County must be indicated on reverse.

Retain organisms in manila tagged plastic bags to avoid mixing capture locations. Note appropriate information on each bag tag.

Keep samples as cool as possible. Put on ice if fish cannot be frozen within 12 hours. If fish are held more than 24 hours without freezing, they will not be retained or analyzed.

Initial recipient (either DEC or designated agent) of samples from collector(s) is responsible for obtaining and recording information on the collection record forms which will accompany the chain of custody. This person will seal the container using packing tape and writing his signature, the time and the date across the tape onto the container with indelible marker. Any time a seal is broken, for whatever purpose, the incident must be recorded on the Chain of Custody (reason, time, and date) in the purpose of transfer block. Container then is resealed using new tape and rewriting signature, with time and date.

EQUIPMENT LIST

Scale or balance of appropriate capacity for the fish to be collected.

Fish measuring board.

Plastic bags of an appropriate size for the fish to be collected and for site bags.

Individually numbered metal tags for fish.

Manila tags to label bags.

Small envelops, approximately 2” x 3.5”, if fish scales are to be collected.

Knife for removing scales.

Chain of custody and fish collection forms.

Clipboard.

Pens or markers.

Paper towels.

Dish soap and brush.

Bucket.

Cooler.

Ice.

Duct tape.

Appendix G – PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) developed the following guidelines for laboratories analyzing environmental samples for PFAS under DER programs. If laboratories cannot adhere to the following guidelines, they should contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov prior to analysis of samples.

Isotope Dilution

Isotope dilution techniques should be utilized for the analysis of PFAS in all media.

Extraction

For water samples, the entire sample bottle should be extracted, and the sample bottle rinsed with appropriate solvent to remove any residual PFAS.

For samples with high particulates, the samples should be handled in one of the following ways:

1. Spike the entire sample bottle with isotope dilution analytes (IDAs) prior to any sample manipulation. The sample can be passed through the SPE and if it clogs, record the volume that passed through.
2. If the sample contains too much sediment to attempt passing it through the SPE cartridge, the sample should be spiked with isotope dilution analytes, centrifuged and decanted.
3. If higher reporting limits are acceptable for the project, the sample can be diluted by taking a representative aliquot of the sample. If isotope dilution analytes will be diluted out of the sample, they can be added after the dilution. The sample should be homogenized prior to taking an aliquot.

If alternate sample extraction procedures are used, please contact the DER remedial program chemist prior to employing. Any deviations in sample preparation procedures should be clearly noted in the case narrative.

Signal to Noise Ratio

For all target analyte ions used for quantification, signal to noise ratio should be 3:1 or greater.

Blanks

There should be no detections in the method blanks above the reporting limits.

Ion Transitions

The ion transitions listed below should be used for the following PFAS:

PFOA	413 > 369
PFOS	499 > 80
PFHxS	399 > 80
PFBS	299 > 80
6:2 FTS	427 > 407
8:2 FTS	527 > 507
N-EtFOSAA	584 > 419
N-MeFOSAA	570 > 419

Branched and Linear Isomers

Standards containing both branched and linear isomers should be used when standards are commercially available. Currently, quantitative standards are available for PFHxS, PFOS, NMeFOSAA, and NEtFOSAA. As more standards become available, they should be incorporated in to the method. All isomer peaks present in the standard should be integrated and the areas summed. Samples should be integrated in the same manner as the standards.

Since a quantitative standard does not exist for branched isomers of PFOA, the instrument should be calibrated using just the linear isomer and a technical (qualitative) PFOA standard should be used to identify the retention time of the branched PFOA isomers in the sample. The total response of PFOA branched and linear isomers should be integrated in the samples and quantitated using the calibration curve of the linear standard.

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated for each target analyte and the ratio compared to standards. Lab derived criteria should be used to determine if the ratios are acceptable.

Reporting

Detections below the reporting limit should be reported and qualified with a J qualifier.

The acid form of PFAS analytes should be reported. If the salt form of the PFAS was used as a stock standard, the measured mass should be corrected to report the acid form of the analyte.

Appendix I - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

These guidelines are intended to be used for the validation of PFAS analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report. Data reviewers should understand the methodology and techniques utilized in the analysis. Consultation with the end user of the data may be necessary to assist in determining data usability based on the data quality objectives in the Quality Assurance Project Plan. A familiarity with the laboratory's Standard Operating Procedure may also be needed to fully evaluate the data. If you have any questions, please contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov.

Preservation and Holding Time

Samples should be preserved with ice to a temperature of less than 6°C upon arrival at the lab. The holding time is 14 days to extraction for aqueous and solid samples. The time from extraction to analysis for aqueous samples is 28 days and 40 days for solids.

Temperature greatly exceeds 6ºC upon arrival at the lab*	Use professional judgement to qualify detects and non-detects as estimated or rejected
Holding time exceeding 28 days to extraction	Use professional judgement to qualify detects and non-detects as estimated or rejected if holding time is grossly exceeded

*Samples that are delivered to the lab immediately after sampling may not meet the thermal preservation guidelines. Samples are considered acceptable if they arrive on ice or an attempt to chill the samples is observed.

Initial Calibration

The initial calibration should contain a minimum of five standards for linear fit and six standards for a quadratic fit. The relative standard deviation (RSD) for a quadratic fit calibration should be less than 20%. Linear fit calibration curves should have an R^2 value greater than 0.990.

The low-level calibration standard should be within 50% - 150% of the true value, and the mid-level calibration standard within 70% - 130% of the true value.

%RSD >20%	J flag detects and UJ non detects
R^2 >0.990	J flag detects and UJ non detects
Low-level calibration check <50% or >150%	J flag detects and UJ non detects
Mid-level calibration check <70% or >130%	J flag detects and UJ non detects

Initial Calibration Verification

An initial calibration verification (ICV) standard should be from a second source (if available). The ICV should be at the same concentration as the mid-level standard of the calibration curve.

ICV recovery <70% or >130%	J flag detects and non-detects

Continuing Calibration Verification

Continuing calibration verification (CCV) checks should be analyzed at a frequency of one per ten field samples. If CCV recovery is very low, where detection of the analyte could be in question, ensure a low level CCV was analyzed and use to determine data quality.

CCV recovery <70 or >130%	J flag results

Blanks

There should be no detections in the method blanks above the reporting limits. Equipment blanks, field blanks, rinse blanks etc. should be evaluated in the same manner as method blanks. Use the most contaminated blank to evaluate the sample results.

Blank Result	Sample Result	Qualification
Any detection	<Reporting limit	Qualify as ND at reporting limit
Any detection	>Reporting Limit and >10x the blank result	No qualification
>Reporting limit	>Reporting limit and <10x blank result	J+ biased high

Field Duplicates

A blind field duplicate should be collected at rate of one per twenty samples. The relative percent difference (RPD) should be less than 30% for analyte concentrations greater than two times the reporting limit. Use the higher result for final reporting.

RPD >30%	Apply J qualifier to parent sample

Lab Control Spike

Lab control spikes should be analyzed with each extraction batch or one for every twenty samples. In the absence of lab derived criteria, use 70% - 130% recovery criteria to evaluate the data.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects

Matrix Spike/Matrix Spike Duplicate

One matrix spike and matrix spike duplicate should be collected at a rate of one per twenty samples. Use professional judgement to reject results based on out of control MS/MSD recoveries.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only
RPD >30%	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only

Extracted Internal Standards (Isotope Dilution Analytes)

Problematic analytes (e.g. PFBA, PFPeA, fluorotelomer sulfonates) can have wider recoveries without qualification. Qualify corresponding native compounds with a J flag if outside of the range.

Recovery <50% or >150%	Apply J qualifier
Recovery <25% or >150% for poor responding analytes	Apply J qualifier
Isotope Dilution Analyte (IDA) Recovery <10%	Reject results

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated from the standards for each target analyte. Lab derived criteria should be used to determine if the ratios are acceptable. If the ratios fall outside of the laboratory criteria, qualify results as an estimated maximum concentration.

Signal to Noise Ratio

The signal to noise ratio for the quantifier ion should be at least 3:1. If the ratio is less than 3:1, the peak is discernable from the baseline noise and symmetrical, the result can be reported. If the peak appears to be baseline noise and/or the shape is irregular, qualify the result as tentatively identified.

Branched and Linear Isomers

Observed branched isomers in the sample that do not have a qualitative or quantitative standard should be noted and the analyte should be qualified as biased low in the final data review summary report. Note: The branched isomer peak should also be present in the secondary ion transition.

Reporting Limits

If project-specific reporting limits were not met, please indicate that in the report along with the reason (e.g. over dilution, dilution for non-target analytes, high sediment in aqueous samples).

Peak Integrations

Target analyte peaks should be integrated properly and consistently when compared to standards. Ensure branched isomer peaks are included for PFAS where standards are available. Inconsistencies should be brought to the attention of the laboratory or identified in the data review summary report.

ATTACHMENT 3

Laboratory's Standard Operating Procedures and
Detection/Reporting Limits for Emerging Contaminants

Title: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometery (GC/MS), SW846 Methods 8270D and 8270E

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

Sylvanus Klusey Organics Operations Manager	Date	Dan Helfrich Health & Safety Manager	Date
Carl Armbruster Quality Assurance Manager	Date	Mark Acierno Laboratory Director	Date

Diaa Nimer Date
SVOA GC/MS Manager

Facility Distribution No. : Electronic **Distributed To: Facility Intranet**

1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

USEPA Methods 8270D and 8270E are analytical methods which employ the use of GC/MS to determine the concentration of semivolatile organic compounds in extracts prepared from many types of solid waste matrices, soils, and water samples

TestAmerica Edison has the capability to analyze and report the compounds listed in Table 1 via Methods 8270D and 8270E.

Table 1

Compound	CAS No.	Compound	CAS No.
1,1'-Biphenyl	92-52-4	Anthracene **(1)**	120-12-7
1,2,4,5-Tetrachlorobenzene	95-94-3	Atrazine	1912-24-9
1,2,4-Trichlorobenzene	120-82-1	Benzaldehyde	100-52-7
1,2-Dichlorobenzene	95-50-1	Benzidine	92-87-5
1,2-Diphenylhydrazine	122-66-7	Benzo[a]anthracene **(1)**	56-55-3
1,3-Dichlorobenzene	541-73-1	Benzo[a]pyrene **(1)**	50-32-8
1,3-Dimethylnaphthalene	575-41-7	Benzo[b]fluoranthene **(1)**	205-99-2
1,4-Dichlorobenzene	106-46-7	Benzo[g,h,i]perylene **(1)**	191-24-2
1,4-Dichlorobenzene-d4 **(ISTD)**	3855-82-1	Benzo[k]fluoranthene **(1)**	207-08-9
1,4-Dioxane **(1) (2)**	123-91-1	Benzoic acid	65-85-0
1-Methylnaphthalene	90-12-0	Benzyl alcohol	100-51-6
1-Naphthylamine	134-32-7	Bis(2-chloroethoxy)methane	111-91-1
2,2'-oxybis[1-chloropropane]	108-60-1	Bis(2-chloroethyl)ether **(1)**	111-44-4
2,3,4,6-Tetrachlorophenol	58-90-2	Bis(2-ethylhexyl) phthalate	117-81-7
2,3,7,8-TCDD	1746-01-6	Bisphenol-A	80-05-7
2,3-Dihydroindene	496-11-7	Butyl benzyl phthalate	85-68-7
2,3-Dimethylaniline	87-59-2	Caprolactam	105-60-2
2,4,5-Trichlorophenol	95-95-4	Carbamazepine	298-46-4
2,4,5-Trimethylaniline	137-17-7	Carbazole	86-74-8
2,4,6-Tribromophenol **(Surrogate)**	118-79-6	Chrysene **(1)**	218-01-9
2,4,6-Trichlorophenol	88-06-2	Chrysene-d12 **(ISTD)**	1719-03-5
2,4-Dichlorophenol	120-83-2	Coumarin	91-64-5
2,4-Dimethylphenol	105-67-9	Dibenz(a,h)anthracene **(1)**	53-70-3
2,4-Dinitrophenol	51-28-5	Dibenzofuran	132-64-9
2,4-Dinitrotoluene	121-14-2	Diethyl phthalate	84-66-2
2,4-Xylidine	95-68-1	Dimethyl phthalate	131-11-3
2,6-Dinitrotoluene	606-20-2	Di-n-butyl phthalate	84-74-2
2-Chloronaphthalene	91-58-7	Di-n-octyl phthalate	117-84-0
2-Chlorophenol	95-57-8	Fluoranthene **(1)**	206-44-0
2-Ethylaniline	578-54-1	Fluorene **(1)**	86-73-7
2-Fluorobiphenyl **(Surrogate)**	321-60-8	Hexachlorobenzene **(1)**	118-74-1
2-Fluorophenol **(Surrogate)**	367-12-4	Hexachlorobutadiene	87-68-3
2-Methylnaphthalene	91-57-6	Hexachlorocyclopentadiene	77-47-4
2-Methylphenol	95-48-7	Hexachloroethane	67-72-1
2-Naphthylamine	91-59-8	Indeno[1,2,3-cd]pyrene **(1)**	193-39-5
2-Nitroaniline	88-74-4	Isophorone	78-59-1
2-Nitrophenol	88-75-5	n,n'-Dimethylaniline	121-69-7
2-tertbutyl-4-methylphenol	2409-55-4	Naphthalene **(1)**	91-20-3
2-Toluidine	95-53-4	Naphthalene-d8 **(ISTD)**	1146-65-2

Table 1

Compound	CAS No.	Compound	CAS No.
3 & 4 Methylphenol	15831-10-4	n-Decane	124-18-5
3,3'-Dichlorobenzidine	91-94-1	Nitrobenzene	98-95-3
3,4-Dimethylaniline	95-64-7	Nitrobenzene-d5 **(Surrogate)**	4165-60-0
3,5-di-tert-butyl-4-hydroxytol	128-37-0	N-Nitrosodimethylamine **(1)**	62-75-9
3-Nitroaniline	99-09-2	N-Nitrosodi-n-propylamine	621-64-7
4,6-Dinitro-2-methylphenol **(1)**	534-52-1	N-Nitrosodiphenylamine	86-30-6
4-Bromophenyl phenyl ether	101-55-3	n-Octadecane	593-45-3
4-chloro-2-methylaniline	95-69-2	o-Toluidine-d9 **(Surrogate)**	194423-47-7
4-Chloro-3-methylphenol	59-50-7	Pentachloronitrobenzene	82-68-8
4-Chloroaniline	106-47-8	Pentachlorophenol **(1)**	87-86-5
4-Chloroaniline–d4 **(Surrogate)**	191656-33-4	Perylene-d12 **(ISTD)**	1520-96-3
4-Chlorophenyl phenyl ether	7005-72-3	Phenanthrene **(1)**	85-01-8
4-Methylphenol	106-44-5	Phenanthrene-d10 **(ISTD**)	1517-22-2
4-Nitroaniline	100-01-6	Phenol	108-95-2
4-Nitrophenol	100-02-7	Phenol-d5 **(Surrogate)**	4165-62-2
Acenaphthene **(1)**	83-32-9	Phenyl ether	101-84-8
Acenaphthene-d10 **(ISTD)**	15067-26-2	Pyrene **(1)**	129-00-0
Acenaphthylene **(1)**	208-96-8	Pyridine	110-86-1
Acetophenone	98-86-2	Terphenyl-d14 **(Surrogate)**	1718-51-0
Aniline	62-53-3	Total Cresols	STL00160
Aniline-d5 **(Surrogate)**	4165-61-1		

(1) Compound can be analyzed by full scan or Selected Ion Monitoring (SIM).
(2) Compound can also be analyzed by Isotope Dilution/SIM.

1.2 For a listing of method detection limits (MDLs) and Reporting Limits (RLs) please refer to the currently active Method 8270 Method Limit Groups in TALS (TestAmerica LIMS).

1.3 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 7 (*Review of Work)*, and Section 19 (*Test Methods and Method Validation)* in TestAmerica Edison's Quality Assurance Manual (TestAmerica Edison Document No. ED-QA-LQM).

1.4 Any variation in procedure shall be completely documented using an NCM. The NCM is approved by the supervisor and then automatically sent to the laboratory Project Manager by e-mail so that the client can be notified as appropriate. The QA department also receives NCMs by e-mail for tracking and trending purposes. The NCM process is described in more detail in SOP ED-GEN-003. The NCM shall be filed in the project file and addressed in the case narrative. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

2.0 Summary of Method

2.1 This method is used for the analysis of aqueous and solid matrices for semi-volatile base, neutral and acid organic compounds that are extracted from the sample matrix with an organic solvent.

2.2 An aliquot of sample containing surrogate spiking compounds is extracted with an organic solvent. The extract is concentrated on a steam bath to a suitable volume. Internal standards are added to the extract.

2.3 Sample extraction techniques are specified for each matrix in the following TestAmerica Edison SOPs:

- ED-ORP-002 (*Extraction of Semivolatile Organic Compounds in Water by Separatory Funnel, SW846 Method 3510C*);
- ED-ORP-043 (*SW846 Method 3580A - Waste Dilution Prep for Analysis of BNAs by SW846 Method 8270);*
- ED-ORP-0044 (*Microwave Extraction for Solids, SW846 Method 3546*);

2.4 A small aliquot of the extract is injected into a gas chromatograph (GC) equipped with a capillary column. The GC is temperature programmed to separate the compounds which were recovered during the extraction step by boiling point. The effluent of the gas chromatograph is interfaced to a mass spectrometer (MS) which is used to detect the compounds eluting from the GC. The detected compounds are fragmented with an electron beam to produce a mass spectrum which is characteristic of the compound introduced into the MS. Identification of target analytes is accomplished by comparing their mass spectra with the electron ionization spectra of authentic standards. Quantitation is accomplished by comparing the response of a major ion (quantitation ion) relative to an internal standard established through a five-point calibration (six points for second order regression). Specific calibration and quality control steps are included in the method that must be performed and must meet the specifications of SW846 Methods 8270D or 8270E as applicable.

2.5 The standard preparation procedure for aqueous samples involves use of a Reduced Volume Extraction (250 ml) (RVE) followed by analysis using a Large Volume Injection (LVI). Optionally, a full volume (1000 ml nominal) may be employed. The details of the extractions are outlined in the applicable prep SOPs while the analytical details for 8270D and 8270E are presented in this SOP.

2.6 These methods are also applicable to the analysis of samples by Selected Ion Monitoring (SIM) for the purpose of obtaining lower reporting limits for the following compounds:

Table 2 – SIM Analytes

SIM Analytes	CAS #
1,4-Dioxane	123-91-1
4,6-Dinitro-2-methylphenol	534-52-1
Acenaphthene	83-32-9

Table 2 – SIM Analytes	
SIM Analytes	**CAS #**
Acenaphthylene	208-96-8
Anthracene	120-12-7
Benzo[a]anthracene	56-55-3
Benzo[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Benzo[g,h,i]perylene	191-24-2
Benzo[k]fluoranthene	207-08-9
Bis(2-chloroethyl)ether	111-44-4
Chrysene	218-01-9
Dibenz(a,h)anthracene	53-70-3
Fluoranthene	206-44-0
Fluorene	86-73-7
Hexachlorobenzene	118-74-1
Indeno[1,2,3-cd]pyrene	193-39-5
Naphthalene	91-20-3
N-Nitrosodimethylamine	62-75-9
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Pyrene	129-00-0

2.7 An isotope dilution selected ion monitoring (SIM) technique for the analysis of 1,4-dioxane in water at a reporting level of 0.2 ug/l is also described in this SOP. Using this technique 1,4-dioxane-d8 is added prior to sample extraction and is used as an internal standard to calculate the concentration of 1,4-dioxane present. Additionally, 1,4-dichorobenzene-d4 is added to the extract prior to analysis to monitor the recovery of 1,4-dioxane-d8.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of the Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Analysts must take steps to determine the source of the interference and take corrective action to eliminate the problem.

4.1.1 Contamination by carryover can occur whenever high-concentration and low-concentration samples are sequentially analyzed. To reduce

carryover, the sample syringe is automatically rinsed with solvent between sample injections. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of a solvent blank to check for cross-contamination. Alternately, verify that the sample analyzed after the high concentration sample does not show any carryover through inspection of chromatogram and target results.

4.1.2 Contaminants from the extraction process detected in the method blank should be evaluated to determine the impact on the analysis. Interferences from any target analyte must not be present in the method blank above the reporting limit for that compound. If these types of interferences occur, corrective action is required. The source should be identified and corrective action initiated to eliminate the interference from the extraction process. Affected samples must be re-extracted and re-analyzed.

4.1.3 The analyst must take precautions to make sure that contaminants do not enter the analytical system. These precautions include systematic procedures designed to eliminate interferences.

4.2 Some compounds analyzed by this method are unstable or sensitive to extraction and/or instrument conditions:

- Benzidine is easily oxidized during extraction. Neutral extraction may enhance the recovery of this compound.
- Hexachlorocyclopentadiene breaks down photochemically and can decompose from high temperatures, particularly in the injection port of the GC. This compound can also react with acetone in solution.
- 1,2-Diphenylhydrazine is unstable even at room temperature and readily converts to azobenzene.
- Phenols are sensitive to active sites and can give a low response or exhibit poor chromatography by tailing. Therefore, it is important the GC is maintained in the best possible condition. See Section 10.1 for proper daily maintenance.
- N-Nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be distinguished from diphenylamine.
- 3-Methylphenol cannot be separated from 4-methylphenol by the conditions specified in this method. They are reported as 3 and 4-methylphenol.
- Pyridine may perform poorly at the GC injection port temperatures listed in this SOP. Lowering the injection port temperature may reduce the amount of degradation.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source.

There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Toluene	Flammable Poison Irritant	200 ppm-TWA 300 ppm-Ceiling	Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Causes severe eye and skin irritation with redness and pain. May be absorbed through the skin.
Dimethyl-dichloro-silane	Flammable	none	Can be corrosive to the respiratory tract causing severe irritation and tissue damage. Harmful if absorbed through the skin. May cause severe irritation and systemic damage. Severely irritating to the skin and eyes. Harmful if swallowed. Can cause abdominal discomfort, nausea, vomiting, diarrhea, and irritation to the mouth, throat and stomach.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Gas chromatograph/mass spectrometer system

6.1.1 Gas chromatograph: An Agilent/HP 6890/7890/900 Intuvo (or equivalent) houses the capillary column. The GC provides a splitless injection port and allows the column to be directly coupled to the mass spectrometer. The oven is temperature programmable to meet the requirements of the method. An HP/Agilent 7673/7683/7963 autosampler (or equivalent) with a 10 ul syringe provides automatic injection of sample extracts while the instrument is unattended.

6.1.2 Analytical Column: 30m x 0.25mm ID, 0.25 um film thickness, Restek Rxi-5Sil MS, Catalog #13623

6.1.3 Mass spectrometer: Agilent (HP) 5972, 5973, 5975 or 5977A Mass Selective Detector (MSD) Capable of scanning from 35 to 500 amu every 1 sec or less, using 70 volts electron energy in the electron ionization mode. The mass spectrometer must be capable of producing a mass spectrum for 50 ng of decafluorotriphenylphosphine (DFTPP) which meets the criteria in Section 9.2.1 when 2 ul of the 25 ug/ml GC/MS tuning standard is injected through the GC.

6.1.4 GC/MS interface: Any GC-to-MS interface may be used that gives acceptable calibration points at 50 ng per injection for each compound of interest and achieves acceptable tuning performance criteria.

6.1.5 Data system: The data system is interfaced to the mass spectrometer and accommodates continuous acquisition and storage of GC/MS data throughout the duration of the chromatographic program. The data system consists of a Hewlett-Packard Chemstation equipped with Mustang software used for instrument control and data acquisition. This, in turn, is interfaced to TestAmerica's Chrom software for data processing. Data from sample extract analysis can be accessed in real-time, while sample data reports and library searches can be performed on data files from previously run samples. The software is also capable of searching any GC/MS data file for ions of a specific mass whose abundances can be plotted versus time or scan number which allows integration of abundances for any extracted ion between specified times or scan-number limits. Library searches utilize a NIST 02.1 Mass Spectral Library.

6.2 Bottles, glass with polytetrafluoroethylene (PTFE)-lined screw caps or crimp tops.

6.3 Injection port liners, splitless

6.4 Injection port septa

6.5 Injection port graphite seals

6.6 Pre-silanized glass wool (Supelco 2-0411 or equivalent)

6.7 Syringes, Assorted sizes 10ul - 1000ul; gas-tight

6.8 Bottles, 10 and 5ml amber screw cap with Teflon liner

6.9 Vials, 2ml amber screw cap with Teflon liner

6.10 Wheaton microvials 100ul (or equivalent)

6.11 Volumetric Flasks, Class A with ground glass stoppers (2ml - 100ml)

6.12 Analytical balance, ASP Model SP-180 (or equivalent), capable of accurately weighing to 0.0001 gr.

7.0 Reagents and Standards

The following items are recommended for performing this procedure. Equivalent items should only be used when they result in an improvement in quality, efficiency, productivity, or cost. An item can be considered equivalent if with its use, the analytical and QA/QC requirements in this SOP can be met. Please refer to the MSDS prior to the use of any reagent or standard.

The preparation of standards, surrogates and spiking solutions is documented in the TALS Reagent Module. Formulary reports can be generated upon request.

7.1. Reagents:

7.1.1. Methylene Chloride: J.T.Baker Resi-Analyzed, used for Organic Residue Analysis (P/N 9266-V8 or equivalent).

7.1.2. Methanol: J.T.Baker Purge and Trap Grade (P/N 9077-02 or equivalent).

7.1.3. Sylon-CT: Supelco (P/N 33065-U or equivalent). Sylon-CT is a highly reactive silanizing reagent consisting of 95% Toluene and 5% Dimethyldichlorosilane (DMDCS).

7.1.4. Each lot of solvent is screened for contaminants before being used for analysis as detailed in TestAmerica Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and TestAmerica Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.2. Standards:

7.2.1. **Calibration Standards (Full Scan Analysis)**: Stock analytical standard solutions are purchased mainly from Restek Corporation. Other standards are prepared in the laboratory as needed using neat compounds or prepared solutions purchased from Agilent, SPEX CertiPrep, Chem Service,

Accustandard, Supelco or other suppliers. Standards prep instructions are detailed for the following full scan analyte list options:

- Full Volume Aqueous Prep; and,
- Reduced Volume Aqueous Prep and Soils

Secondary dilutions are either made from purchased stock solutions as listed below or from prepared solutions as listed in the following table:

NOTE: Second sources (from certified separate lots) are used for ICV standards.

Table 3 – Full Scan Stock Standards			
Target Analyte Standard Name	**Conc. (PPM)**	**Vendor**	**Catalog #**
1,2,3,4-TCDD	50	SPEX	SVO-TANJ-12
Agilent Mix (contains compounds listed in Table 4 below)	2000 *	Agilent	Cus 0456
8270 List 1/ Std #1 Megamix	Varied	Restek	571995
8270 List 1/ Std#9	2000	Restek	569730
8270 List 1/ Std#11	2000	Restek	569732
8270 Surrogate Standard	5000*	Restek	567685
8270 Internal Standard	2000	Restek	567684
8270 List 1/ Std#10	2000	Restek	569731
Bisphenol-A	1000	Agilent	Cus-0457

*Agilent Mix, 8270 list1/std#9 and 8270 Surrogate standard are diluted to 100ppm prior to the preparation of the 1.0ppm and 0.5ppm standards.

Table 4	
Agilent Mix Catalog No. Cus-0456	
Analyte	**Concentration (PPM)**
Pentachloronitrobenzene	2000
2 -tert-butyl-4-Methylphenol	2000
2,6-Di-tert-butyl-4-Methylphenol	2000
Coumarin	2000
Phenyl ether	2000
N,N'-Dimethylaniline	2000
N-Methylaniline	2000
Carbamazepine	2000
Benzonitrile	2000
1,3-Dimethylnaphthalene	2000

7.2.1.1. Individual calibration standards for full scan analysis are prepared in one of several ways depending upon the technique (full volume aqueous prep, soils prep, reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of calibration standard solutions for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 5
Full Volume Aqueous Prep and Soils
Working Standards Preparation

Solution Name	120 PPM	80 PPM	50 PPM	20 PPM	10 PPM	5 PPM	2 PPM	1 PPM	0.5 PPM
8270 List 1/ Std #1 Megamix	3000 ul	2000 ul	2500 ul	500ul	250ul	250ul	100ul	50ul	25ul
8270 List 1/ Std #9	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	50ul	500ul*	250ul *
8270 List 1/ Std #10	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	-	-	-
Agilent custom Mix	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	50ul	500ul*	250ul *
1,2,3,4-TCDD	-	-	500ul	-	-	-	-	-	-
8270 Surrogate Standard	600ul	400ul	500ul	100ul	50ul	50ul	20ul	500ul*	250ul *
8270 Internal Standard	500ul	500ul	1000 ul	500ul	500ul	1000 ul	1000 ul	1000 ul	1000 ul
Bisphenol-A	3000 ul	2000 ul	2500 ul	500ul	250ul	250ul	100ul	-	-
8270 List 1/ Std #11	400ul	300ul	500ul	200ul	125ul	125ul	50ul	25ul	-
Final Volume (ml)	**25**	**25**	**50**	**25**	**25**	**50**	**50**	**50**	**50**

Note: The 1.0ppm and 0.5pmm standards (above) are prepared using the 100ug/ml standard for Agilent custom Mix, 8270 List1/std#9 and 8270 Surrogate Standard.

Table 6
Reduced Volume Extraction/LVI
Working Standards Preparation

Solution Name	24 PPM	16 PPM	10 PPM	4 PPM	2 PPM	1 PPM	0.4 PPM	0.2 PPM	0.1 PPM
120 ppm (see Table 5)	2.0mL								
80 ppm (see Table 5)		2.0 mL							
50 ppm (see Table 5)			2.0 mL						
20 ppm (see Table 5)				2.0 mL					

Table 6 Reduced Volume Extraction/LVI Working Standards Preparation									
Solution Name	**24 PPM**	**16 PPM**	**10 PPM**	**4 PPM**	**2 PPM**	**1 PPM**	**0.4 PPM**	**0.2 PPM**	**0.1 PPM**
10 ppm (see Table 5)					2.0 mL				
5.0 ppm (see Table 5)						2.0 mL			
2.0 ppm (see Table 5)							2.0mL		
1.0 ppm (see Table 5)								2.0 mL	
0.5 ppm (see Table 5)									2.0mL
Final Volume (ml)	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**

7.2.1.2. **Initial Calibration Verification (full scan**): Second source ICVs for full scan analysis are prepared in one of several ways depending upon the technique (full volume aqueous prep, soils prep, reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of ICVs for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 7 8270/625 ICV Working Standards Preparation	
Solution Name	**25 PPM**
8270 List 1/ Std #1 Megamix (2nd Lot)	250ul
8270 List 1/ Std #9 (2nd Lot)	125ul
8270 List 1/ Std #10 (2nd Lot)	125ul
Agilent custom Mix (2nd Lot)	125ul
8270 Internal Standard	200ul
8270 List 1/ Std#11	125ul
Bisphenol-A (2nd Lot)	250ul
Final Volume (ml)	**10**

7.2.1.3. **Surrogate Standards (Full Scan Analysis):** A 5000ppm Surrogate Standard is purchased from Restek for use in spiking blanks, samples and associated QC prior to extraction (reference the applicable sample prep SOPs for spiking instructions).

Table 8 Full Scan Surrogate Standards Solution Restek Catalog No. 567685	
Surrogate Standard Compounds	**Concentration (PPM)**
Nitrobenzene-d5	5000
p-Terphenyl-d14	5000
2,4,6-Tribromophenol	5000
Phenol-d5	5000
2-Fluorobiphenyl	5000
2-Fluorophenol	5000

7.2.1.4. **Internal Standards** (**Full Scan Analysis**): The Internal Standards Solution at 2000ppm is purchased from Restek (Catalog # 567684). The Internal Standard solution is stored in 10ml amber screw cap bottles with Teflon liners in the dark at 4°C. The Internal standard solution is used in preparing all analytical standards. Inject 20ul of this solution (2000ppm) per ml of sample extract prior to analysis resulting in a concentration of 40ppm (ug/ml) in the extract.

Table 9 Full Scan Internal Standards Solution Restek Catalog No. 567684	
Internal Standard Compounds	**Concentration (PPM)**
1,4-Dichlorobenzene-d4	2000
Phenanthrene-d10	2000
Naphthalene-d8	2000
Chrysene-d12	2000
Acenaphthene-d10	2000
Perylene-d12	2000

7.2.2. **Calibration Standards (SIM analysis)**: The Edison lab currently analyzes only a select list of compounds by 8270D/8270E SIM (see Sections 1.0 and 2.0). Stock analytical SIM standard solutions are purchased mainly from Agilent. Working standards are prepared from these solutions as listed in the tables in Section 7.2.2.1:

Table 10 Stock SIM Standards			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
Pentachlorophenol	1000ppm	AGILENT	PH-180-1
n-Nitrosodimethylamine	100ppm	AGILENT	NS-100-1
Hexachlorobenzene	100ppm*	AGILENT	CH-151-1
PAH Mix	100ppm	AGILENT	PAH-605-1
Bis(2-chloroethyl)ether	100ppm*	AGILENT	BEC-110-1
4,6-Dinitro-2-methylphenol	1000ppm**	AGILENT	PH-150
1,4-Dioxane	1000ppm**	AGILENT	NV-152-1

*Hexachlorobenzene and Bis(2-chloroethyl)ether are diluted to 10ppm prior to SIM Standards prep

** 4,6-Dinitro-2-methylphenol and 1,4-Dioxane is diluted (10x) to 100ppm prior to SIM Standards prep

NOTE: Second sources (from separate lots are used for ICV standards).

7.2.2.1 Individual calibration standards for SIM analysis are prepared in one of two ways depending upon the technique (full volume aqueous prep or reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of calibration standard solutions for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 11
Full Volume Aqueous Prep – SIM
Working Standards Preparation

	0.025 PPM	**0.05 PPM**	**0.1 PPM**	**0.5 PPM**	**1.0 PPM**	**5.0 PPM**
Pentachlorophenol	2.5uL	2.5uL	12.5uL	10uL	20uL	50uL
n-Nitrosodimethylamine	25uL	25uL	125uL	100uL	200uL	500uL
PAH mix	6.25uL	5uL	25uL	50uL	100uL	200uL
Hexachlorobenzene	25uL	25uL	250uL	1000uL	2000uL	500uL*
Bis(2-chloroethyl)ether	25uL	25uL	250uL	1000uL	2000uL	500uL*
4,6-dinitro-2-methylphenol	50ul	50ul	250ul	200ul	400ul	1000ul
1,4-Dioxane	25ul	50ul	250ul	200ul	400ul	1000ul
ISTD	500uL	200uL	500uL	200uL	200uL	200uL
Final Volume (ml)	**25**	**10**	**25**	**10**	**10**	**10**

*For Hexachlorobenzene and Bis(2-chloroethyl)ether the 5.0 ppm level is prepared using the 100ppm standard.

Table 12
Reduced Volume Extraction/LVI – SIM
Working Standards Preparation

	0.005 PPM	**0.01 PPM**	**0.02 PPM**	**0.10 PPM**	**0.20 PPM**	**1.0 PPM**
0.025 PPM Std (see Table 11)	1.0 mL					
0.05 PPM Std (see Table 11)		1.0 mL				
0.1 PPM Std (see Table 11)			1.0 mL			
0.5 PPM Std (see Table 11)				1.0 mL		
1.0 PPM Std (see Table 11)					1.0 mL	
5.0 PPM Std (see Table 11)						1.0 mL
Final Volume (ml)	**5**	**5**	**5**	**5**	**5**	**5**

7.2.2.2 Initial Calibration Verification (SIM): A 0.1 ppm separate lot SIM ICV is prepared as detailed in Table 13 using the stock standards detailed in Section 7.2.2 (above)

Table 13 0.1ppm SIM ICV preparation	
Pentachlorophenol	25uL
n-Nitrosodimethylamine	25uL
PAH mix	5uL
Hexachlorobenzene	5uL
1,4-Dioxane	5ul
4,6-Dinitro-2-methylphenol	100ul
ISTD	**100uL**
Final Volume	**5 ml**

7.2.2.3 Internal Standard solution (SIM): A 50 ppm Internal Standard solution for SIM analysis is prepared by adding 125ul of the 2000ppm stock ISTD (see Section 7.2.1.4) and bringing to volume with Methylene Chloride in a 5ml volumetric flask.

7.2.2.3.1 For SIM analysis inject 20ul of this solution (50ppm) per ml of sample extract prior to analysis resulting in a concentration of 1ppm (ug/ml) in the extract.

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7.2.3. Calibration Standards (Isotope Dilution SIM – 1,4-Dioxane): The Edison lab currently analyzes only for 1,4-dioxane by 8270D/8270E isotope dilution SIM (see Sections 1.0 and 2.0). Stock analytical isotope dilution SIM standard solutions are purchased mainly from Accustandard and Restek. Working standards are prepared from these solutions as listed in the tables below.

Table 14 - Stock 1,4-Dioxane Isotope Dilution SIM Standards			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dioxane	1000ppm*	Accustandard	APP-9-096

* 1,4-Dioxane is diluted (10x) to 100ppm prior to SIM Standards prep

Table 15 - Stock Labeled 1,4-Dioxane SIM Surrogate/Internal Standard (added at prep)			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dioxane-d8	2000ppm	Restek	30614

Table 16 - Stock 1,4-Dioxane Isotope Dilution SIM Internal Standard (added to extract)			
Standard Name	**Concentration**	**Vendor**	**Catalog #**

1,4-Dichlorobenzene-d4	2000ppm	Accustandard	AZ-014J-3

7.2.3.1 Individual calibration standards for 1,4-dioxane isotope dilution SIM analysis are prepared at the concentrations detailed in the following tables. Prepare by combining the appropriate volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 17
Reduced Volume Extraction/LVI – 1,4-Dioxane Isotope Dilution SIM
ICAL Standard Concentrations (ug/ml)

	Lev 1	Lev 2	Lev 3	Lev 4	Lev 5	Lev 6	Lev 7	Lev 8	ICV*
1,4-Dioxane	0.02	0.04	0.1	0.2	0.5	1	2	10	0.2
1,4-Dioxane-d8	4	4	4	4	4	4	4	4	4
1,4-Dichlorobenzene-d4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

***:** The ICV is prepared from the second source stock in Table 13.

7.2.4. GC/MS Instrument Performance Check (DFTPP): The DFTPP standard is prepared by is prepared at 25 ppm by adding 2.5ml of EPA 8270 GC/MS Tuning Solution II (Restek Catalog # 31615) to a 100ml volumetric flask and bringing to volume with Methylene Chloride.

7.2.5. Information on prepared standard solutions must be recorded in the TALS Reagent Module. Information such as standard supplier, lot number, original concentration, a description of how the standard was made, are required along with the laboratory lot number, analyst's initials, date prepared, expiration date and verification signature. Standards must be remade every 6 months, or sooner, if the standards expire or begin to show signs of unacceptable degradation. Class "A" volumetric must be used at all times and syringes, preferably gas-tight syringes when available, should be checked for accuracy using an analytical balance. Class "A" pipettes should also be used if volumes permit.

7.2.6. Please refer to TestAmerica Edison SOP No. ED-GEN-008, Standard Operating Procedure for Preparation, Purity and storage of Reagents and Standards.

- Shelf Life of Standard: 1 year after preparation or stock standard manufacture expiration, whichever comes first;
- Storage Requirements: Stock standards are stored at 4°C and Working Standards stored at -10°C to -20°C.

8.0 Sample Collection, Preservation, Shipment and Storage

8.1 All samples must be stored at 4ºC (± 2ºC) upon receipt.

8.2 Sample Extract Storage. Samples extracts must be protected from light and refrigerated at 4ºC (± 2ºC) from time of extraction until analysis.

8.3 Sample Extract Holding Time. All sample extracts must be analyzed within 40 days of extraction.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Amber glass, 1L	1000 ml or 250 ml (1)	Cool 4 ± 2ºC	7 days to extraction; Analyze within 40 days of extraction	EPA Method SW846 8270D/8270E
Solids	Wide mouth glass, 8 or 16 oz.	50g	Cool 4 ± 2ºC	14 days to extraction; Analyze within 40 days of extraction	EPA Method SW846 8270D/8270E

(1) : Reduced volume extraction (RVE) LVI option

9.0 Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]
Internal Standards	Every sample	Response within -50% to +100% of CCV

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client….predetermined by the extraction lab.
[3] Analytical and QC samples (MB, LCS, MS/MSD, Method Blank)
[4] Statistical control limits are determined annually and are updated into TALS limit group..

9.1.1. **Method blanks** are extracted with every sample batch on each day that samples are extracted. To be considered acceptable, the method blank must contain less than the reporting limit of all target compounds except for

phthalates, which can be present at up to 5x the MDL. For method 8270E the method blank is generally acceptable if target analyte concentrations are less than the one half the reporting limit.

If method blanks are unacceptably contaminated with target compounds that are also present in field samples, all affected samples must be re-extracted and re-analyzed. Corrective action must be taken to identify and eliminate the contamination source. Demonstrate that acceptable blanks can be obtained before continuing with sample extraction and analysis. Method blanks must be analyzed on each instrument on which the associated samples are analyzed.

9.1.1.1. Surrogate recoveries for the method blank are compared to laboratory generated limits. If two or more surrogates for any one fraction (base-neutral or acid) are outside of recovery limits or if any one surrogate recovers at <10%, the sample must be re-extracted and re-analyzed to confirm matrix interference.. If any surrogate is still outside limits, all samples and QC samples associated with that method blank must be re-extracted (volume permitting).

9.1.2. Matrix Spike (MS)/Matrix Spike Duplicate (MSD): A matrix spike/matrix spike duplicate (MS/MSD) pair is extracted and analyzed with every 20 environmental samples of a specific matrix (defined as a sample batch). Full compound list spiking is employed for MS/MSDs and LCSs. These spikes are prepared and extracted concurrent with sample preparation. MS and MSD recoveries are calculated and compared to lab generated acceptance criteria. See the current active TALS 8270 Method Limit Group for QC limits. The MS/MSD spiking solution should the same as used for the calibration standards.

9.1.2.1 A Laboratory Control Sample Duplicate (LCSD) is extracted and analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.2.2 An LCS/LCSD may be substituted for the MS/MSD if insufficient sample volume is available.

9.1.3. Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD): A Laboratory Control Sample (LCS) (aka blank spike) must be extracted and analyzed with each batch of 20 environmental samples. The LCS data is used to assess method performance if the MS/MSD recoveries fall outside of the lab generated limits (See the current active TALS 8270 Method Limit Group for QC limits). If the LCS recovery is within the current lab generated limits, the MS/MSD recoveries are attributed to matrix interference.

9.1.3.1 A Laboratory Control Sample Duplicate (LCSD) is extracted and analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.3.2 Spike recovery limits are lab generated and are updated annually. Certain state regulatory programs have defined recovery limits which, where applicable, are used for spike recovery evaluations. The TALS Method Limit Groups detail these regulatory program criteria.

9.1.4. Surrogate Standards: All full scan samples, blanks and QC samples are spiked with a six (6) component surrogate standard mix (see Section 7.2.1.3). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (See the current active TALS 8270 Method Limit Group for QC limits*)*.

If any two or more surrogates for any one fraction (base-neutral or acid) are outside of recovery limits or if any one surrogate recovers at <10%, the sample must be re-extracted and re-analyzed to confirm matrix interference. If a surrogate is diluted to a concentration below that of the lowest calibration standard, no corrective action is necessary.

9.1.4.1 Surrogate recovery limits are lab generated and are updated annually. Certain state regulatory programs have defined recovery limits which, where applicable, are used for spike recovery evaluations. The TALS Method Limit Groups detail these regulatory program criteria.

9.1.5. Internal Standards: The response (area count) of each internal standard in the sample must be within -50 +100% of its corresponding internal standard in the CCV or, the ICAL midpoint for samples analyzed under the initial calibration range. Failure to meet these criteria is indicative of sample matrix effects. All samples failing these criteria must be reanalyzed to confirm matrix effects.

9.2. Instrument QC

9.2.1 GC/MS Instrument Performance Check (DFTPP): (**Note**: the DFTPP performance check applies only to full scan analyses and is not evaluated for SIM analysis). The GC/MS system is tuned using Perfluortributylamine (PFTBA) such that an injection of 50ng of Decafluorotriphenylphosphine (DFTPP) meet the abundance criteria listed in the table below. Prior to the analysis of any calibration standards or samples, the GC/MS system must meet all DFTPP key ion abundance criteria. This analysis will verify proper tuning of the system for a period of 12 hours post-injection. After 12 hours, the instrument performance must again be verified prior to the analysis of standards, QC or samples. Daily tune verification is not required for 8270E CCV.

DFTPP Key Ions and Abundance Criteria	
Mass	**Ion Abundance Criteria**
51	30-60% of mass 198
68	<2% of mass 69
69	reference only
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base Peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

9.2.1.1. Evaluate DFTPP using three scan averaging and background subtraction techniques. Select the scan at the peak apex, add +1 scan from the apex and -1 scans from the apex.

9.2.1.2. The mass spectrum of DFTPP may be background subtracted to eliminate column bleed or instrument background ions. Background subtract DFTPP by selecting a scan for subtraction ≤20 scans before the apex scan of DFTPP.

9.2.1.3. Check column performance using pentachlorophenol and the benzidine peaks (these compounds are included in the DFTPP solution). Benzidine & Pentachlorophenol should respond normally without significant peak tailing (Tailing Factor should be <2 measured at 10% peak height). If responses are poor and excessive peak tailing is present, corrective action for the GC/MS instrument may be required. Corrective actions may include:

9.2.1.3.1 Retune the GC/MS;
9.2.1.3.2 Clip the injector end of the GC column;
9.2.1.3.3 Replace the septum and injection port liner;
9.2.1.3.4 Change the injection port seal;
9.2.1.3.5 Replace the GC column;
9.2.1.3.6 Clean the injection port with MeCl2
9.2.1.3.7 Clean the MS ion source;
9.2.1.3.8 Place a service call.

9.2.1.4. The breakdown of 4, 4-DDT into 4,4-DDD and 4,4'DDE may also be used to assess GC column performance and injection port inertness. If so evaluated the breakdown must be <20%.

9.2.1.5. DFTPP parameter settings are stored in a tune file, which will be used in all subsequent analysis of standards and sample extracts.

9.2.2 Initial Calibration Range and Initial Calibration Verification

9.2.2.1. Initial Calibration: The initial calibration range consists of a minimum of five concentration levels of analytical standards (six for second order regression) prepared as described in Section 7.2. and analyzed once the DFTPP instrument performance check has met the criteria in Section 9.2.1. .

9.2.2.2. Initial Calibration Verification (ICV): An Initial Calibration Verification (ICV) standard is analyzed immediately after the Initial Calibration Range and before any samples are analyzed. The ICV is prepared as detailed in Section 7.2. The ICV must be from a source (or lot) separate from the standards used in the Initial Calibration Range.

9.2.3 Continuing Calibration Verification (CCV) and Low Level Continuing Calibration Verification (LLCCV): A mid-point Continuing Calibration Verification (CCV) must be analyzed every 12 hours after the DFTPP instrument performance check (when applicable).. The CCV is prepared as detailed in Section 7.2. (typically, 50 ug/ml for full volume aqueous and soils, 10 ug/ml for LV, 0.02 ug/ml for LVI SIM) and 0.2 for isotope dilution SIM). Additionally a Low Level Continuing Calibration Verification (LLCCV) is analyzed after the CCV for full scan analysis. The LLCCV is the same as the lowest calibration level analyzed with the initial calibration range (See Section 7.2).

9.2.4 Calibration Acceptance Summary

9.2.4.1. Retention Time Windows: Retention time windows must be established to compensate for minor shifts in absolute retention times as a result of sample loading and normal chromatographic variability. Obtain the retention time for all compounds from the analysis of the midpoint standard for the calibration curve. Establish the center of the retention time window by using the absolute retention time for each analyte, internal standard and surrogate from the calibration verification standard at the beginning of the analytical shift. For samples run during the same shift as an initial calibration, use the retention time of the mid-point standard of the initial calibration. For qualitative identification to be acceptable the retention time of the relative retention time (automatically calculated in Chrom) must be within 0.8 - 1.2 RRT units of its assigned internal standard. The relative retention times of each compound in the five calibration standards must agree within .06 relative retention time units.

9.2.4.2. Initial Calibration Range: Internal standard calibration is employed for this method. After the initial calibration range has been analyzed the relative response factor (RRF) for each target/surrogate compound at each concentration level is determined using the following equation.

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:
A_x = Area characteristic ion (see Table 21) for the compound
Ais = Area characteristic ion (see Table 21) of associated internal standard
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

9.2.4.2.1. Determine the mean RRF for each compound. Minimum response factors must be met for each of the compounds listed in Table 18 (below). Any compound that fails the minimum response factor must be reported as estimated for detects and must have a demonstration of sensitivity in the analytical batch to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only but the standard qualitative identification criteria in the method must be met.

Table 18:
Minimum Response Factors

Compound	Minimum Response Factor
Benzaldehyde	0.010
Phenol	0.800
Bis(2-chloroethyl) ether	0.700
2-Chlorophenol	0.800
2-Methylphenol	0.700
2,2-Oxybis-(1-chloropropane)	0.010
Acetophenone	0.010
4-Methylphenol	0.600
N-Nitroso-di-n-propylamine	0.500
Hexachloroethane	0.300
Nitrobenzene	0.200
Isophorone	0.400
2-Nitrophenol	0.100
2,4-Dimethylphenol	0.200
Bis(2-chloroethoxy)methane	0.300
2,4-Dichlorophenol	0.200

Table 18: Minimum Response Factors	
Compound	**Minimum Response Factor**
Naphthalene	0.700
4-Chloroaniline	0.010
Hexachlorobutadiene	0.010
Caprolactam	0.010
4-chloro-3-methylphenol	0.200
2-Methylnaphthalene	0.400
Hexachlorocyclopentadiene	0.050
2,4,6-Trichlorophenol	0.200
2,4,5-Trichlorophenol	0.200
1,1'-Biphenyl	0.010
2-Chloronaphthalene	0.800
2-Nitroaniline	0.010
Dimethyl phthalene	0.010
2,6-Dinitrotoluene	0.200
Acenaphthylene	0.900
3-Nitroaniline	0.010
Acenaphthene	0.900
2,4-Dinitrophenol	0.010
4-Nitrophenol	0.010
Dibenzofuran	0.800
2,4-Dinitrotoluene	0.200
Diethyl phthalate	0.010
1,2,4,5-Tetrachlorobenzene	0.010
4-chlorophenyl-phenyl ether	0.400
Fluorene	0.900
4-Nitroanailine	0.010
4,6-Dinitro-2-methylphenol	0.010
4-Bromophenyl-phenyl ether	0.100
N-Nitrosodiphenylamine	0.010
Hexachlorobenzene	0.100
Atrazine	0.010
Pentachlorophenol	0.050
Phenanthrene	0.700
Anthracene	0.700
Carbazole	0.010
Di-n-butyl phthalene	0.010
Fluoranthene	0.600
Pyrene	0.600
Butyl benzyl phthalate	0.010
3,3'-Dichlorobenzidine	0.010
Benzo(a)anthracene	0.800
Chrysene	0.700
Bis-(2-ethylhexyl)phthalate	0.010
Di-n-octyl phthalate	0.010

Table 18: Minimum Response Factors	
Compound	**Minimum Response Factor**
Benzo(b)fluoranthene	0.700
Benzo(k)fluoranthene	0.700
Benzo(a)pyrene	0.700
Indeno(1,2,3-cd)pyrene	0.500
Dibenz(a,h)anthracene	0.400
Benzo(g,h,i)perylene	0.500
2,3,4,6-Tetrachlorophenol	0.010
Pentachloronitrobenzene	0.050

9.2.4.2.2. Calculate the Standard Deviation (SD) and Percent Relative Standard Deviation (% RSD) of the response factors for each compound:

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

9.2.4.2.3. The % RSD of the RRF's must be ≤20% for each target analyte listed in Table 18. The % RSD of each target analytes must be ≤20% in order for the calibration range to be acceptable. Additionally for 8270E, the calculated concentration or amount of each analyte of interest in the CCV standard should fall within ±20%. If more than 10% of the compounds included with the initial calibration exceed the 20% RSD limit or do not meet the minimum correlation coefficient (0.99) for alternate fits (see below) then appropriate corrective maintenance action must be performed. If more than 10% of the compounds included with the initial calibration exceed the 20% RSD limit **AND** do not meet the minimum correlation coefficient (0.99) then recalibration is necessary.

9.2.4.2.4. If the above listed criteria is met, the system can be assumed to be linear and sample analysis may begin and the average RF from the initial calibration range is used to quantitate all samples.

9.2.4.2.4.1 Certain state regulatory programs have defined calibration acceptance limits which, where applicable, are used for calibration evaluations. The TALS ICAL Limit Groups detail these regulatory program criteria.

9.2.4.2.5. An alternative calibration technique may be employed for those any compounds exceeding the 20% RSD criteria:

9.2.4.2.5.1 Calculate the first order linear regression for any compound which did not meet the 20% criteria. First order linear regression calibration may be employed if alternative average response calibration procedures were not applicable. The r value (Correlation Coefficient) of the equation must be ≥0.99 for the calibration to be employed.

9.2.4.2.5.2 Second order regression calibration can be used for any compound that has an established history as a non-linear performer.

9.2.4.2.5.3 If second order regression calibration is used a minimum of six (6) calibration levels must be analyzed.

9.2.4.2.5.4 If second order regression calibration is used, the r^2 (Correlation Coefficient) value must be $\geq$ 0.99

9.2.4.2.5.5 Any compound that fails to meet the 20% RSD or or 0.99 correlation coefficient criteria must be flagged as estimated for detects (or must be noted in the narrative). If there are non-detects the compounds may be reported if there is adequate sensitivity to detect at the quantitation limit. To demonstrate adequate sensitivity analyze the low level point of the initial calibration in each analytical batch (LLCCV) The criteria for demonstrating adequate sensitivity is detection in the LLCCV using the standard qualitative identification criteria.

9.2.4.2.5.6. When calculating the calibration curve using the linear calibration model a minimum quantitation check on the viability of the lowest calibration point should be performed by re-fitting the response from the low concentration back into the curve. The recalculated concentration of the low calibration point should be within ±50% of the standard's concentration. This evaluation can be checked using the Initial Calibration %Drift Report in Chrom. Any detects for analytes calibrated using the linear model and failing this readback criterion must be flagged as estimated or detailed in the narrative.

9.2.4.3. Calibration Point Read-back Criteria: Whichever calibration model above is selected, it should be subjected to an additional check to establish the representativeness of the data that were used to produce it. This check is the refitting of each calibration

point response back to the calibration model, or the comparison of the calculated amount of the standard against the expected amount.

- CHROM software provides an Initial Calibration %Drift report which shows the % Error for each calibration point. This report must be reviewed in addition to the %RSD / Linear Response Factor.

- The absolute value of the % Error for each calibration point should be < 30%. For the lowest calibration point, the % Error may be <50%.

- See Section 11.8 for the Calculation of Percent (%) Error.

9.2.4.4. **Initial Calibration Verification (ICV):**.Once the initial calibration has been analyzed and has met the above criteria, a second source Initial Calibration Verification (ICV) (as prepared in Section 7.2) must be analyzed and evaluated. The ICV must meet the criteria of 70-130% recovery for all compounds with the exception of the poor performing compounds listed in Attachment 1 which are allowed to be within 50-150% : An NCM must be initiated to denote any ICV non-conformances.

9.2.4.5. The ICV must meet the criteria of 70-130% recovery for all compounds however up to 10% of the compounds are allowed to exceed these criteria as long as their recoveries are within 65-135%. For the poor performers (see Attachment 1) the range is 50-150%. If the criterion is not met, a second ICV may be analyzed after corrective measures are taken. If a second ICV analysis fails to meet criteria proceed with corrective action and the analysis of a new initial calibration range. Flagging: If the ICV limits are outside of criteria (high) for an analyte and that analyte is undetected in the sample, no flagging or narration is required. If the ICV limits are outside of criteria (low) for an analyte and that analyte is undetected in a sample, narrate the non-conformance in an NCM. When that out of spec analyte is detected in a sample, describe the issue in the narrative, or flag as estimated.

9.2.4.6. **Continuing Calibration Verification (CCV):** A CCV consisting of a standard at or near the midpoint of the Initial Calibration Range is analyzed every 12 hours of instrument operation or at the beginning of an analytical sequence to verify the initial calibration. The calibration verification consists of a DFTPP instrument performance check (not required for 8270E), and analysis of a calibration verification standard. **Note:** Certain state regulatory programs have defined calibration acceptance limits which, where applicable, are used for calibration

evaluations. The TALS ICAL Limit Groups detail these regulatory program criteria.

9.2.4.5.1 Tune Verification: Follow the procedure for verifying the instrument tune described in section 9.2.1 using a 50 ng injection of DFTPP. If the tune cannot be verified, analysis must be stopped, corrective action taken and a return to "control" demonstrated before continuing with the calibration verification process. For 8270E analysis only, tune verification is required just prior to ICAL.

9.2.4.5.2 Calibration Verification: Analyze the calibration verification standard immediately after a DFTPP that meets criteria. Daily analysis of the DFTPP is not required as part of the CCV for 8270E analysis. .When samples are analyzed after an ICAL the last ICAL standard may be used as the starting time reference for evaluation. Use the mid point calibration standard (approximately 50ug/l). NOTE: The calibration standard contains internal standards; Dichlorobenzene d_4, Naphthalene d_8, Acenaphthene d_{10}, Phenanthrene d_{10}, Chrysene d_{12}, and Perylene d_{12} at 40ug/l (0.1ug/L for SIM). The calibration check standard must also include all the target analytes from the original calibration.

9.2.4.5.3 The RFs must meet the criteria for the compounds in Table 18. Any compound that fails the minimum response factor must be reported as estimated for detects and must have a demonstration of sensitivity to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only but the standard qualitative identification criteria in the method must be met

9.2.4.5.4 The percent difference (when using average response factor) or percent drift (when using linear regression) of the compounds in Table 18 must be ≤20% for at least 80% of the total analyte list. If more than 20% of the compound list fail to 20% difference or drift criterion then appropriate corrective action must be taken prior to the analysis of the samples. Any individual compound that fails must be reported as estimated for detects and must have a demonstration of sensitivity to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The

criterion for the LLCCV is detection only (%D criteria are not applied) but the standard qualitative identification criteria in the method must be met.

9.2.4.5.5 **CCV Poor Performers**: Refer to Attachment 1 for the identification of poor and/or erratic performing analytes. These analytes are allowed a %D >20% but must be <50 %D to be acceptable. If there are poor performers that exceed 50%D, the data may be reported provided results are noted as estimated. An NCM must be initiated to denote this situation.

9.2.4.5.6 The retention times of the internal standards from the calibration check must be within ±30 seconds of the internal standards from the mid point standard of the original calibration. If the retention time for any internal standard changes by more than 30 seconds from the latest daily (12 hour) calibration standard, the chromatographic system is inspected for malfunctions, and corrections made as required. If corrective action does not result in the retention time criteria being achieved, the system must be re-calibrated using four additional standards.

9.2.4.5.7 The response (area count) of each internal standard in the calibration verification standard must be within 50 - 100% of its corresponding internal standard in the mid-level calibration standard of the active calibration curve. If the EICP area for any internal standard changes by more than a factor of two (-50% +100%), the mass spectrometer system must be inspected for malfunction and corrections made as appropriate. When corrections are made, re-analysis of samples analyzed while the system was malfunctioning is required.

9.2.4.5.8 The relative retention times of each compound in the calibration verification standard must agree within .06 relative retention time units of its value in the initial calibration.

9.2.4.5.9 Use the average response factors from the original five-point calibration for quantitative analysis of target analytes identified in field samples.

9.2.4.5.10 Prepare a calibration summary or list indicating which compounds did not meet the 20% average percent difference criteria. Record this information in that run log.

9.2.4.7. Low Level Continuing Calibration Verification (LLCCV): An LLCCV consisting of the low level standard from the initial

calibration range is analyzed every 12 hours of instrument operation after the CCV. The purpose and evaluation of the LLCCV is described in Section 9.2.4.4.4.

10.0 Procedure

10.1. Gas Chromatograph/Mass Spectrometer Operation

10.1.1. The sequence of events for GC/MS analysis involves many steps. First the injection system and column performance and calibration must be verified. Maintenance operations are performed as needed.

10.1.2. Preparation of the Injection Port Liner and Installation Procedure: Prior to the start of initial calibration and each daily analysis of sample extracts, a new liner for the injection port must be prepared. Once a liner has been used it is no longer inert and will cause serious chromatography problems with phenols and other compounds. When preparing the liner, proper laboratory protection must be worn and the liner must be prepared in a well-ventilated hood. When the procedure is completed all traces of toluene, Sylon-Ct and methanol will be removed immediately so that extraction solvents and preparation of sample extracts will not come into contact with these solvents and become contaminated.

10.1.2.1 Remove one liner from a 40ml VOA bottle containing other liners immersed in Sylon-Ct solution. Rinse off the liner with Toluene and wipe dry. Insert 1cm of pre-silanized glass wool partially into one end of the liner and trim neatly. Push the glass wool into the center of the liner so that it is 1 1/4" from the bottom. Do not use glass wool or solvents that are dirty (i.e. suspended particles) or use liners which are chipped on the ends, deformed or fractured. Inspect the glass wool for cleanliness after it has been inserted.

10.1.2.2 Using a Pasteur pipette flush out the interior of the liner containing the glass wool with Sylon-Ct. Rest the liner horizontally on a small beaker and allow the Sylon-Ct to re-deactivate the interior surfaces and the glass wool. There should be no air bubbles caught in the glass wool. After several minutes flush out the Sylon-Ct with toluene and finally with methanol. Dry the outer surface of the liner and rest it on the injection port housing until the remaining methanol is boiled off

10.1.2.3 Insert the liner with the newly silanized glass wool plug into the injection port. Verify that the column extends up into the injection port and is perpendicular. Inspect the graphite seal and replace it if the edges are knife-shaped.

10.1.2.4 The septum is always replaced daily. Bake out the column at 300^{O}C for 15 minutes after the vacuum in the analyzer has returned to normal.

10.1.2.5 Performance may enhanced by clipping a small portion of the column at the injection port end. Document this activity in the maintenance record.

10.1.3. Prior to calibration or sample analysis always verify that the analyzer is under sufficient vacuum and that the column has proper carrier gas flow.

10.1.4. Establish the following GC/MS operating conditions:

10.1.4.1 Full Scan Operating Mode

Full Scan Mode – Standard Injection Volume
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300°C
Source Temperature: Preset by H.P. at 280°C
Scan start time: 1.0 minutes
Initial Column Temperature and Hold Time: 45°C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C 25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310°C for 5 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275°C
Injector: Grob-type, pulse, splitless
Injection Volume: 1ul
Splitless Valve Time: 0.3 minutes

Full Scan Mode – Large Volume Injection (LVI)
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300°C
Source Temperature: Preset by H.P. at 280°C
Scan start time: 1.0 minutes
Initial Column Temperature and Hold Time: 45°C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C

25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310°C for 5 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275°C
Injector: Grob-type, pulse, splitless
Injection Volume: 5ul
Splitless Valve Time: 0.3 minutes

10.1.4.2 SIM Operating Mode

SIM Mode
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300°C
Source Temperature: Preset by H.P. at 280°C
Scan start time: 1.5 minutes
Initial Column Temperature and Hold Time: 40°C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C 25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310°C for 3 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275°C
Injector: Grob-type, pulse splitless
Injection Volume: 1ul
Splitless Valve Time: 0.3 minutes

10.1.4.3 Isotope Dilution Selected Ion Monitoring Mode :

SIM Parameters

Group 1
Plot 1 Ion: 74.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	42.0 50	43. 0 50	68.0 50
	74.0 50	128.0 50	129.0 50
	136.0 50	150.0 50	152.0 50
	93.0 50	66.0 50	
	58.0 50		
	88.0 50		

Group 2
Group Start Time: 6.00
Plot 1 Ion: 152.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	151.0 50	152.0 50	153.0 50
	154.0 50	162.0 50	164.0 50
	165.0 50	166.0 50	

Group 3
Group Start Time: 7.80
Plot 1 Ion: 188.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	94.0 50	101.0 50	142.0 50
	178.0 50	179.0 50	188.0 50
	202.0 50	264.0 50	266.0 50
	284.0 50		

Group 4
Group Start Time: 10.50
Plot 1 Ion: 228

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	120.0 50	228.0 50	229.0 50
	240.0 50		

Group 5
Group Start Time: 12.00
Plot 1 Ion: 252.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	138.0 50	139.0 50	252.0 50
	253.0 50	260.0 50	264.0 50
	267.0 50	276.0 50	278.0 50

Table 19: Target Compound - Primary and Monitoring Ions

Compound	1	2	3
1,4-Dioxane-d8	96	64	62
1,4-Dioxane	88	58	57
1,4-Dichlorobenzene-d4	152	150	

10.1.5. The above listed instrument conditions are used for all analytical standards for calibration and for all sample extracts analyzed by this method.

10.1.5.1 The column conditions, scan start time, and splitless valve time for analysis of DFTPP only are as follows are as follows:

Initial Column Temperature and Hold Time: 140^{o}C for 0.5 minutes
Column Temperature Program: 140^{o} to 320^{o}C at 22^{o}C/minute
Final Column Temperature Hold: 320C for 0.5 minutes
Scan Start Time: approx. 5 minutes
Splitless Valve Time: 0.3 minutes
Injection Volume: 2 ul

10.2. Analytical Sequence

10.2.1. Dilutions are made based on initial GC/MS analysis. Dilutions are made in 1-ml vials using microsyringes. Calculate the dilution factor using the equation below:

DF= Ph / 5 x Is
Where:
DF = Dilution Factor
Ph = Sample Peak Height
Is = Internal Standard Peak Height

When DF >1 but <2, combine 500ul of sample extract with 500ul methylene chloride in a 1 ml amber vial, add20 ul internal standard and crimp seal

Use **Table 20** to determine dilution and internal standard amount.

Table 20
Dilution Factor Calculations

DF Value	Volume of Sample (ul)	Volume of Methylene Chloride (ul)	Volume of ISTD (ul)
<1	1,000	None	None
>1, <2	500	500	10
>4, <5	200	800	16
>10, <20	100	900	36
>20	500*	500	10
*Prepare this dilution by serially diluting the >10, <20 dilution			

10.2.2. Instrument Performance and Calibration Sequence

10.2.2.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.2.2.2. Analyze the Instrument Performance Check Standard (DFTPP) as discussed in Section 9.2.1.

10.2.2.3. Initially and as required, analyze the Initial Calibration Range (minimum 5 points, six points for second order regression) as detailed in Sections 7.2.1 and 9.2.4.2. Evaluate the acceptability of the Initial Calibration Range as detailed in Section 9.2.4.2.

10.2.2.4. Immediately after the Initial Calibration Range only, analyze the Initial Calibration Verification (ICV) as detailed in Sections 7.2. and 9.2.4.3. Evaluate the acceptability of the ICV as detailed in Section 9.2.4.3.

10.2.2.5. Every 12 hours, reanalyze and evaluate the Instrument Performance Check Standard (DFTPP), not required for 8270E followed by the Continuing Calibration Verification (CCV) and Low Level Continuing Calibration Verification (LLCCV) as detailed in Section 9.2.3, 9.2.4.4 and 9.2.4.5. Evaluate the acceptability of the CCV and LLCCV as detailed in Section 9.2.4.4

10.2.2.6. Client samples and QC samples are analyzed (as detailed in Section 10.2.3) after acceptable Instrument Performance and Calibration Checks and until the 12 hour clock expires. Repeat the sequence as required. The automation of GC/MS runs is accomplished via the “SEQUENCE” macro of the ChemStation.

10.2.3. Sample Analysis Sequence

10.2.3.1. Sample extracts are normally prepared on the same day as analysis. The GC/MS operator will prepare the extracts that will be run on his or her instrument. Volume adjustments to the extracts will be made at the discretion of the supervisor.

10.2.3.2. Prior to the start of sample analysis the GC/MS operator will generate a sequence program containing the list of the sample extracts to be analyzed, the position on the autosampler tray, and the proper acquisition and tune methods that are to be used. This sequence program contains all the necessary information on the samples to be analyzed and how the GC/MS system is to analyze them. The sample extracts are loaded onto the autosampler (ALS) tray. Their position is verified by checking them against the ALS number on the sequence. This batch analysis will be performed automatically over the 12-hour period.

10.2.3.3. The analytical run log is printed as a record of samples analyzed. The analyst will annotate the run log with any required information regarding anomalies or unusual events. The run log must be signed by the analyst and a reviewed and signed by a trained peer or manager

10.3. Data Processing

10.3.1. Prior to processing any standards or samples, target compound lists and sublists must be assembled. Chrom's auto-processing system queries TALS (LIMS) for each sample's processing parameters (including target compounds lists) and downloads the required processing methods from LIMS to analyze data. These lists are required for processing of all data files including calibration files. The data includes compound names, retention time data, quantitation ions, qualitative identification ions, and the assigned internal standard for qualitative and quantitative identification.

10.3.2. Key data is manually entered the first time a compound list is used for data processing. Processing data using a compound list automatically generates response factor data and updates retention information.

10.3.3. The characteristic ions for target compounds, surrogate compounds, and internal standards which can be determined using SW8270D and 8270E are listed in Table 21..

10.4. Interpretation and Qualitative Identification: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.4.1 Target Analytes: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.4.1.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.4.1.2. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other.

10.4.1.3. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

10.4.1.4. The most abundant ion in the standard target spectrum that equals 100% MUST also be present in the sample target spectrum.

10.4.1.5. All other ions that are greater than 10% in the standard target spectra should also be present in the sample.

10.4.1.6. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%).

10.4.1.7. If the compound does not meet all of the criteria listed above, but is deemed a match in the technical judgment of the mass spectral interpretation specialist, the compound will be positively identified and reported with documentation of the identification noted in the raw data record.

10.4.2 Non-Target Analytes: Upon client request a library search to identify non-target Tentatively Identified Compounds (TIC) is performed. The NIST/EPA/NIH mass spectral library is used to identify non-target compounds (not including internal standard and surrogate compounds) of greatest apparent concentration by a forward search of the library. The following guidelines are used by the analyst when making TIC identifications:

10.4.2.1. Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

10.4.2.2. The relative intensities of the major ions should agree within ±20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

10.4.2.3. Molecular ions present in the reference spectrum should be present in the sample spectrum.

10.4.2.4. Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

10.4.2.5. Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

10.4.2.6. If, in the technical judgement of the mass spectral interpretation specialist, no tentative identification can be

made, the compound will be reported as 'Unknown'. If the compound can be further classified the analyst may do so (i.e, 'Unknown hydrocarbon', 'Unknown acid' , etc.).

10.5. Data Reporting

10.5.1. Final Report. The Chom data system automatically produces a data report consisting of hardcopy reports corresponding to specific data reporting requirements, which is uploaded to the TALS LIMS System for the report production group.

10.5.1.1. Total Ion Chromatogram. Full length chromatogram depicting the full length of the GC/MS acquisition.

10.5.1.2. Spectra of all detected target compounds. A page for each detected target compound spectra with a standard reference spectrum for comparison.

10.5.1.3. The calculations of the concentrations of each target compound in the sample, reported in units of ppb, ug/kg or ug/l.

10.5.1.4. Data summaries for each method blank indicating which samples were extracted with the indicated blank.

10.5.1.5. A copy of the initial calibration range together with the calibration verification report, and tune report.

10.5.1.6. Quality Control (QC) data report for each batch including surrogate recoveries, internal standard area summaries, LCS, MS/MSD and RPD summaries.

10.6. The low-level calibration standard establishes the reporting limit. All reported data must be at a concentration at or above the low concentration standard. Any quantitative values below the report limit must be qualified as estimated.

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11.0. Calculations/Data Reduction

11.1. Target Compounds: are quantitated using the internal standard method (see the formula in Section 11.3).

11.1.1. Identified target compounds are quantitated using the integrated abundance from the EICP of the primary characteristic ion. The internal standard used shall be the one nearest the retention time of the analyte).

11.1.2. The average response factor (RRF) from the initial calibration is used to calculate the target analyte concentration in client samples using the formula found in Section 11.3. See Section 9.2.4 for discussion of RRF.

11.1.3. Secondary ion quantitation is utilized only when there are sample interferences preventing use of the primary characteristic ion. If secondary ion quantitation is used an average relative response factor (RRF) must be calculated using that secondary ion.

11.2. Non-Target Compounds (Tentatively Identified Compounds): An estimated concentration for non-target (tentatively identified compounds) is calculated using the internal standard method (see formula in Section 11.3). For quantiation, the nearest eluting internal standard free of interferences is used. The procedure used for calculating the concentration of non-target compounds is the same as that used for target compounds (see Section 11.1) with the following revisions:

11.2.1. The total area count of the non-target compound is used for As (instead of the area of a characteristic ion).

11.2.2. The total area count of the chosen internal standard is used as Ais (instead of the area of a characteristic ion).

11.2.3. A RF on 1.0 is assumed.

11.2.4. The resulting concentration is qualified as estimated ('J') indicating the quantitative uncertainties of the reported concentration.

11.3. Internal Standard Calculation:

11.3.1. Aqueous Samples

$$\text{Concentration } (\mu g/L) = \frac{(As)(Cis)(D)}{(Ais)(RF)(Vs)\ (Vi)\ (1000)}$$

Where:

As	=	Area of the characteristic ion for the target analyte in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the characteristic for the associated internal standard
RF	=	Average response factor from the initial calibration.
Vs	=	Volume of sample extracted (ml)

The 1000 in the denominator represents the number of ul in 1 ml.

11.3.2. Solid Samples

$$\text{Concentration } (\mu g/KG) = \frac{(As)(Cis)(D)(Vt)}{(Ais)(RF)(Ws)\,(Vi)\,(1000)}$$

Where:

As	=	Area of the characteristic ion for the target analyte in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the characteristic for the associated internal standard
RF	=	Average response factor from the initial calibration.
Vt	=	Volume of concentrated extract (ul)
Ws	=	Weight of sample (g)

The 1000 in the denominator represents the number of ul in 1 ml.

11.4. Relative Response Factors

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:

A_x = Area characteristic ion for the compound (see Table 21)
Ais = Area characteristic ion of associated internal std (See Table 21)
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

11.5. Percent Relative Standard Deviation (% RSD) : as discussed in Section 9.2.4.4 (Initial calibration):

$$\%\ RSD = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

11.6. Percent Difference (% D):as discussed in Section 9.2.4.4 (Continuing calibration):

$$\%\ D = \frac{RRF_c - \overline{RRF_i}}{\overline{RRF_i}} \times 100$$

Where: RRFc = RRF from continuing calibration

$\overline{RRF_i}$ = Mean RRF from current initial calibration

11.7. Percent Recovery (% R): Surrogates and Spikes

$$\text{Recovery (\%)} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) added}} \times 100$$

11.8. Calculation of Percent (%) Error

$$\%Error = \frac{x_i - x_i'}{x_i} x\,100$$

Where:

x_i ' = Measured amount of analyte at calibration level *i*, in mass or concentration units

x_i = True amount

11.9. Dry Weight Correction: All solid samples must be corrected for dry weight using the following formula for dry weight determination.

$$DW = \frac{Gd}{Gw} \times 100$$

Where:

DW	=	Percent % Dry Weight
Gd	=	Dry weight of selected sample aliquot
Gw	=	Wet weight of selected sample aliquot

Multiply the DW value times the wet weight of the sample extracted. NOTE: This calculation can also be performed automatically by the target system provided the DW value is available and entered into the system.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

A Method Detection Limit (MDL) study, as described in the TestAmerica corporate Detection and Quantitation Limits SOP, CA-Q-S-006, must be performed initially and whenever a significant change affecting sensitivity is made to the analytical system. The MDL must be re-evaluated from quarterly MDL points at least every 12 months.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Lower Limit of Quantitation Verification

The lowest calibration standard analyzed establishes the LLOQ or Reporting Limit. The capability to reliably detect this concentration through the preparation, clean-up and analytical procedure is verified through the annual analysis of a standard at the LLOQ/RL. The LLOQ verification shall also be performed whenever significant changes are made to the preparation and/or analytical procedure.

12.3.1 The LLOQ verification standard shall be prepared at a concentration 0.5-2 times the LLOQ/RL, and be taken through all of the same preparation and clean-up methods as client samples.

12.3.2 The LLOQ verification standard for aqueous matrix shall be prepared using laboratory deionized water and for the solid matrix using clean Ottawa sand. Other clean matrices may be used in addition, for project specific requirements.

12.3.3 The LLOQ shall be verified annually on each instrument used for client sample analysis.

12.3.4 Recovery of each analyte must meet the laboratory established LCS recovery limits + 20%. (For example, if the LCS recovery limits are 70-130%, the LLOQ verification must meet recovery limits of 50-150%.) Once sufficient points have been generated, LLOQ based statistical limits may be used in place of limits based on LCS recovery.

NOTE: The lower recovery limit for the LLOQ can be no lower than 10%.

12.4. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, (*Training*), for the laboratory's training program.

13.0. Pollution Control

13.1 It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1 Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica Edison SOPs Nos. ED-SPM-007 (*Disposal of Samples and*

Associated Laboratory Waste, current revision) and ED-SPM-008 (*Laboratory Waste Disposal Procedures, current revision)*. The following waste streams are produced when this method is carried out:

- Auto sampler vials and expired standards: These vials are collected in satellite accumulation within the instrument laboratory. The vials are then placed into a 55 steel open top drum in the waste room. When the drums are full, the drum will be collected by the waste vendor for disposal. This waste is treated for incineration.

  Teris Profile Number: 50016652
  Onyx Profile WIP Number: 282493

- Mixed Solvent Waste: Mixed solvent waste is collected in a small beaker inside the bench top hood. This waste is then transferred into the satellite accumulation container in the Organic Prep. Lab. on a daily basis. This material is transferred into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.

  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

14.1. Pollution Prevention

14.2.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

14.2.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

15.0. References / Cross-References

15.1. United States Environmental Protection Agency, “Method SW8270D, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry”, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Laboratory Manual, Physical/Chemical Methods, Revision 5, July 2014..

15.2. United States Environmental Protection Agency, "Method SW8270E, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry", Test Methods for Evaluating Solid Wastes, SW846 Update IV, Laboratory Manual, Physical/Chemical Methods, Revision 6, June 2018.

15.3. United States Environmental Protection Agency, "Method SW8000D: Determinative Chromatographic Separations", Test Methods for Evaluating Solid Wastes, SW846, Laboratory Manual, Physical/Chemical Methods, Update V, Revision 4, October 2012..

15.4. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, current revision.

15.5. TestAmerica Edison SOP No. ED-ORP-002, *SW846 Method 3510C-Extraction of Semi-Volatile Organic Compounds in Water by Separatory Funnel,* current revision.

15.6. TestAmerica Edison SOP No. ED-ORP-043, *SW846 Method 3580A - Waste Dilution Prep for Analysis of BNAs by SW846 Method 8270,* current revision.

15.7. TestAmerica Edison SOP No. ED-ORP-044, *Procedure for the Microwave Extraction of Solids, SW3546, current revision.*

15.8. TestAmerica Document No. CW-E-M-001, Corporate Environmental Health and *Safety Manual,* current revision.

15.9. TestAmerica Corporate Quality SOP No. CA-Q-S-001, *Solvent & Acid Lot Testing & Approval*, current revision.

15.10. TestAmerica Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*), current revision.

15.11. TestAmerica Edison SOP No. ED-GCS-001, *Preparation and Screening of Semivolatile Organic Extracts for GC/MS Analysis*, current revision.

15.12. TestAmerica Edison Work Instruction Document No. EDS-WI-012, *Client Complaint/Corrective Action Form,* current revision.

15.13. TestAmerica Edison SOP No. ED-GEN-003, *Standard Operating Procedure for Control of Non-Conformances and Corrective Action,* current revision.

15.14. TestAmerica Edison SOP No. ED-ORP-001, *Extraction of Semivolatile Organic Compounds in Water, EPA Method 625.1,* current revision.

15.15. TestAmerica Edison SOP No. ED-GEN-022, *Training,* current revision.

15.16. TestAmerica Corporate Quality Memorandum, CA-Q-QM-002, *GC/MS Tuning Policy*, current revision.

15.17. TestAmerica Corporate Quality SOP No. CA-Q-S-006, *Detection and Quantitation Limits,* current revision.

16.0. Method Modifications:

Method 8270E requires the DFTPP tune standard to be analyzed once prior to an ICAL and not daily prior to sample analysis. Until such time as 8270D is removed from lab capabilities and in order to satisfy both 8270D and 8270E The laboratory will analyze the DFTPP tune daily, prior to QC and sample analysis. The laboratory will use the tighter criteria from Methods 8270C/8270D for tune evaluation, rather than the criteria suggested in Table 3 of Method 8270E.

17.0. Attachments

Attachment 1 Poor Performing Analytes

18.0. Revision History

- Revision 9, date 03/15/2021
    - Updated as needed to reflect 1,4-dioxane RL of 0.2 ug/l.
    - Updated Tables 11 and 12 to reflect new low ICAL standard concentration of 1,4-dioxane..
- Revision 8, date 06/29/2020
    - Updated to Eurofins branding.
    - Updated throughout to include 8270E requirements.
    - Removed references to SW846 3550B/C prep methods (no longer in use for this method at Edison lab).
    - Update equipment listed in Section 6.0.Updated analytical column in Section 6.1.2.
    - Updated, deleted and renumbered tables as required.
    - Made extensive updates to Standards (sources and preparation) in Section 7.2.
    - Removed all references to Aromatic Amines. Deleted all tables specific to Aromatic Amine analysis. Renumbered remaining tables in document and updated text references.
    - Throughout document clarified tune requirements for 8270E.
    - Following added to Section 9.1.1: For method 8270E the method blank is generally acceptable if target analyte concentrations are less than the one half the reporting limit.
    - Calibration Point Read-back Criteria was added to Section 9.2.4.3. The calculation for percent error was added to Section 11.8.
    - Section 9.2.4.2.3: added following for 8270E: the calculated concentration or amount of each analyte of interest in the CCV standard should fall within ±20%.
    - Section 9.2.4.2.5.6: added ‘The recalculated concentration of the low calibration point should be within ±50% of the standard’s concentration.”
    - Section 12.1 revised to reflect the updated MDL procedure.
    - Added Section 12.3: annual Lower Limit of Quantitation Verification
    - Added Corporate SOP CA-Q-S-006, Detection and Quantitation Limits to references.
    - Section 16.0: added a Method Modification regarding tuning check requirements.

- Revision 7, date 06/08/2018

    - Section 2.3: revised to clarify that RVE/LVI is lab standard procedure.
    - Section 9.1.3: removed statement regarding allowance for up to five analytes to recover outside of lab acceptance limits in LCS/LCSD.
    - Section 9.2.4.3: Replace table 'ICV Poor Performers (50-150% Recovery) with expanded list of 'Poor Performing Analytes' in Attachment 1.
    - Added Section 9.2.4.4.5: CCV Poor Performers
    - Corrected number in section 9.2.4.5
    - Added Attachment 1 – Poor Performing Analytes

- Revision 6, date 01/12/2018:

    - Section 7.2.5 included to specify reagent and standard storage conditions.
    - Revised Section 9.1.3 to clarify requirements for specific LCS/LCSD evaluation criteria regarding the # of out of criteria analytes.
    - Revised Section 9.2.4.3 to add 2,4-Dimethylphenol as a poor performing analyte, increased the range for the poor performers to 50-150 and also expanded the guidelines for flagging the ICV outliers.

- Revision 5, dated 09/29/2017:
    - Revised Section 9.1.1 to clarify requirements for surrogate recovery in method blanks.

- Revision 4, dated 08/21/2017:
    - Updated throughout to add a procedure for the analysis of 1,4-dioxane by isotope dilution selected ion monitoring (SIM)
    - Added tables for isotope dilution SIM standards. Renumbered all tables as necessary.
    - Section 7.2.1: added a list of full scan calibration list options.
    - Table 3: Renamed 'Full Scan Stock Standards'.
    - Section 9.2.1: noted that DFTTP applies only to full scan analysis.
    - Section 9.2.3: updated CCV concentrations
    - Added reference to GC/MS Tuning Policy in Section 15.16.

- Revision 3, dated 01/07/2016:
    - Tables 1 and 2: added SIM as option for 1,4-Dioxane.
    - Section 2.3: removed SW3541 (Soxtherm) as option for soils prep (lab has discontinued use of this method). Also removed SW3541 SOP reference from Section 15.0.
    - Tables 19 and 20: added source and prep instructions for 1,4-Dioxane SIM standard. Updated source and prep instructions for 4,6-Dinitro-2-methylphenol.
    - Table 22: added prep instructions for 1,4-Dioxane and 4,6-Dinitro-2-methylphenol SIM ICV standard.
    - Corrected the information in the 'DFTPP Key Ions and Abundance Criteria' table in Section 9.2.1 to match the info found in SW846 8270C.
    - Section 10.1.4.2: updated "SIM Parameters" to included ion masses/dwell times for 1,4-Dioxane.

- Revision 2, dated 01/28/2015:
    - Extensively reformatted the SOP. Placed tables that had been in rear of document into the body of the text. Renumbered tables as applicable and fixed text references to tables.
    - Section 1.1, Table 1: Revised table to include all current analytes. Also footnoted those compounds which are currently analyzed by SIM.
    - Section 2.3: added options for extraction of solids by SW846 3456 (Microwave Extraction) and by SW3580A (Waste Dilution) and added SOP references. Deleted reference to SOP ED-ORP-005 (SW3550B – Low Level); Updated Section 15 (References).
    - Section 2.5: added text detailing the RVE/LVI options.
    - Section 2.6: added table which includes all analytes routinely analyzed by SIM.
    - Section 6: updated to include newer GC, MS and autosampler models currently in use.
    - Section 6.1.3: added Zebron ZB column as an option.
    - Section 7.2: extensively revised standards information to reflect switch to Restek standards.
    - Table 3:Added Custom Aromatic Amine Surrogate Standard and revised Table 8 to include initial calibration prep instructions for the Aromatic Amine surrogates.
    - Throughout document: removed references to Target and replaced with Chrom.
    - Section 7.2.1: Added reference to section 10.2.1.2 for LVI.
    - Added Section 7.2.1.3.1 and Table 17A both of which discuss use of Aromatic Amine surrogates.
    - Section 7.2.1.2: Added reference to Tables 9,10 and 11 (ICV Preparation)
    - Section 8.0: Added Sample container and minimum sample size (250 ml) for Reduced volume extraction.
    - Sections 9.1.2, 9.1.3, 9.1.4 and 9.2.4: added statement that certain state regulatory programs have defined recovery limits which, where applicable, are used for spike and calibration evaluations.
    - Section 9.1.2: Deleted sentence “A minimum of 16 spiked analytes are reported to in client reports (the full list is reported at least once during each 2 year period because we employ full spiking list.
    - Section 9.1.4: Added note regarding use of Aromatic Amine Surrogates.
    - Section 9.2.2.2: Added reference to ICV Preparation tables in Section 7.2.
    - Section 9.2.3: added more specific info as to the concentration of the CCVs for all techniques.
    - Section 9.2.4.2.1: Changed to reflect that each analyte should meet minimum RF’s, not the average across the calibration. Added LLCCV requirement.
    - Section 10.3.1: added explanation of Chrom’s interaction with TALS. Removed references to Target.
    - Section 9.2.4.2.5.5: Added: (or can be noted in the narrative)
    - Section 9.2.4.2.5.6: Revised last sentence to read: “This evaluation can be checked using the Initial Calibration %Drift Report in Chrom.”
    - Section 9.2.4.3: Removed 65-135% criteria and added “poor performing” analyte list and associated criteria of 60-140%.
    - Section 9.2.4.4.3: Added LLCCV criterion for RFs
    - Section 9.2.4.4.4: Added LLCCV criterion for %D
    - Section 10.1.4: Updated GC/MS operating conditions for full scan, SIM and DFTPP.
    - Section 10.1.4.1: added a table detailing operating conditions for LVI option.
    - Table 2: Added 2-ethylaniline, 2,4-dimethylaniline, 3,4-dimethylaniline, 2,3-

dimethylaniline, 2,4,5-trimethylaniline and 4-chloro-o-toluidine to Working Standards preparation information.
- Table 25: updated to include all current analytis/surrogates/internal standards and associated ions.
- Throughout document: updated LQM section references as appropriate as some have changed with the latest LQM revision.

- Revision 1, dated 11/07/2011

  - Section 1.1, Table 1: Added Pentachloronitrobenzene and associated CAS# to the analyte list.
  - Section 7.2.1: Added Pentachloronitrobenzene standard information.
  - Table 2: Added Pentachloronitrobenzene to Working Standards preparation information.
  - Table 4: Added Pentachloronitrobenzene and associated minimum RF.
  - Table 8: Added Pentachloronitrobenzene and associated ions.

- Revision 0, dated 02/22/2011: NEW

Table 21
Characteristic Ions Of Semi-Volatile Organic Compounds

Compound	Primary Ion	Secondary Ion(s)
1,1'-Biphenyl	154	153,76
1,2,4,5-Tetrachlorobenzene	216	214, 179
1,2,4-Trichlorobenzene	180	182, 145
1,2-Dichlorobenzene	146	148, 111
1,2-Diphenylhydrazine	77	105, 182
1,3-Dichlorobenzene	146	148, 111
1,3-Dimethylnaphthalene	156	141, 115
1,4-Dichlorobenzene	146	148, 111
1,4-Dichlorobenzene d4 **(ISTD)**	152	150, 115
1,4-Dioxane	88	58, 43
1-Methylnaphthalene	142	141, 115
1-Naphthylamine	143	115, 116
2,2'-oxybis[1-chloropropane]	45	77, 121
2,3,4,6-Tetrachlorophenol	232	131, 230
2,3,7,8-TCDD (screen)	320	322, 324
2,3-Dihydroindene		
2,3-Dimethylaniline	106	129
2,4,5-Trichlorophenol	196	198, 200
2,4,5-Trimethylaniline	102	55, 56
2,4,6-Tribromophenol **(Surrogate)**	330	132, 141
2,4,6-Trichlorophenol	196	198, 200
2,4-Dichlorophenol	162	164, 98
2,4-Xylidine	121	120, 106

Table 21 Characteristic Ions Of Semi-Volatile Organic Compounds		
Compound	**Primary Ion**	**Secondary Ion(s)**
2,4-Dimethylphenol	122	107, 121
2,4-Dinitrophenol	184	63, 154
2,4-Dinitrotoluene	165	63, 89
2,6-Dinitrotoluene	165	63, 89
2-Chloronaphthalene	162	127, 164
2-Chlorophenol	128	64, 130
2-Ethylaniline	106	122,104
2-Fluorobiphenyl **(Surrogate)**	172	171
2-Fluorophenol **(Surrogate)**	112	64
2-Methylnaphthalene	142	141
2-Methylphenol	108	107
2-Naphthylamine	143	115, 116
2-Nitroaniline	65	108, 138
2-Nitrophenol	139	109, 65
2-tert-butyl-4-Methylphenol	149	121, 91
2-Toluidine	107	106, 77
3,3'-Dichlorobenzidine	252	254, 126
3,4-Dimethylaniline	106	129, 127
3,5-Di-tert-butyl-4-Hydroxytol	205	220, 145
3-Nitroaniline	138	108, 65
4,6-Dinitro-2-methylphenol	198	51, 105
4-Bromophenyl phenyl ether	248	250, 141
4-chloro-2-methylaniline	106	144, 142
4-Chloro-3-methylphenol	107	144, 142
4-Chloroaniline	127	129
4-Chloroaniline-d4 **(Surrogate)**	131	133
4-Chlorophenyl phenyl ether	204	206, 141
4-Methylphenol	108	107
4-Nitroaniline	138	108, 65
4-Nitrophenol	139	109, 65
Acenaphthene	154	153, 152
Acenaphthene d10 **(ISTD)**	164	162, 160
Acenaphthylene	152	151, 153
Acetophenone	105	77, 51
Aniline	93	66
Aniline-d5 **(Surrogate**)	98	71,42
Anthracene	178	176, 179
Atrazine	200	173,215
Benzaldehyde	77	105,106
Benzidine	184	92, 185
Benzo(a)anthracene	228	229, 226
Benzo(a)pyrene	252	253, 125
Benzo(b)fluoranthene	252	253, 125
Benzo(g,h,i)perylene	276	138, 277
Benzo(k)fluoranthene	252	253, 125
Benzoic Acid	122	105, 77

Table 21 Characteristic Ions Of Semi-Volatile Organic Compounds		
Compound	**Primary Ion**	**Secondary Ion(s)**
Benzyl Alcohol	108	79, 77
Bis(2-chloroethoxy)methane	93	95, 123
Bis(2-chloroethyl)ether	93	63, 95
Bis(2-ethylhexyl)phthalate	149	167, 279
Bisphenol-A	213	228, 119
Butyl benzyl phthalate	149	91, 206
Caprolactam	113	55,56
Carbamazepine	193	236, 135
Carbazole	167	166, 139
Chrysene	228	226, 229
Chrysene d12 **(ISTD)**	240	120, 136
Coumarin	146	118, 63
Dibenz(a,h)anthracene	278	139, 279
Dibenzofuran	168	139
Diethylphthalate	149	177, 150
Dimethylphthalate	163	194, 164
Di-n-butylphthalate	149	150, 104
Di-n-octylphthalate	149	167, 43
Fluoranthene	202	101, 203
Fluorene	166	165, 167
Hexachlorobenzene	284	142, 249
Hexachlorobutadiene	225	223, 227
Hexachlorocyclopentadiene	237	235, 272
Hexachloroethane	117	201, 199
Indeno(1,2,3-cd)pyrene	276	138, 227
Isophorone	82	95,138
Kepone	272	237, 355
N,N-Dimethylaniline	120	122, 104
Naphthalene	128	129, 127
Naphthalene d8 **(ISTD)**	136	68
n-decane	43	57
Nitrobenzene	77	123, 65
Nitrobenzene-d5 **(Surrogate)**	82	128, 54
N-Nitrosodimethylamine	42	74, 44
N-Nitroso-di-n-propylamine	170	42,101,130
N-Nitrosodiphenylamine	169	168, 167
n-Octadecane	57	43, 85
o-Toluidine-d9 **(Surrogate)**	114	112, 42
Pentachloronitrobenzene	237	214,295
Pentachlorophenol	266	264, 268
Perylene d12 **(ISTD)**	264	260, 265
Phenanthrene	178	179, 176
Phenanthrene d10 **(ISTD)**	188	94, 80
Phenol	94	65, 66
Phenol-d5 **(Surrogate)**	99	42, 71
Phenyl ether	170	77, 115

Table 21 Characteristic Ions Of Semi-Volatile Organic Compounds		
Compound	**Primary Ion**	**Secondary Ion(s)**
Pyrene	202	200, 203
Pyridine	79	52, 51
Terphenyl-d14 **(Surrogate)**	244	122, 212

Attachment 1
Poor Performing Compounds

1,2,4,5-Tetrachlorobenzene
1,4-Dioxane
1-Naphthylamine
2,3,4,6-Tetrachlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2-Chloroaniline
2-Naphthylamine
3&4-Methylphenol
3'3-Dichlorobenzidine
4,6-Dinitro-2-methyl- phenol
4-Chloroaniline
4-Nitrophenol
Aniline
Atrazine
Benzaldehyde
Benzidine
Benzoic Acid
Benzyl Alcohol
Biphenyl
Caprolactam
Diphenylamine
Hexachlorocyclopentadiene
Hexachloroethane
n-Decane
n-Nitrosodimethylamine
o,o,o-Triethylphosphorothioate
o-Toluidine
Pentachloronitrobenzene
Pentachlorophenol
Phenol
Pyridine

These analytes are exempt from the ICV and CCV criteria as detailed in this SOP

Title: Per- and Poly-fluorinated Substances (PFAS) in Water, Soils, Sediments and Tissue

[Method 537 (Modified), PFAS by LCMSMS]

Approvals (Signature/Date):

09/28/2020
Don Dawicki Date
Laboratory Director

09/28/2020
Ryan Hammond Date
Operations Manager / EHS Coordinator

09/28/2020
Kristine Dusablon Date
Quality Assurance Manager / Technical Manager

09/28/2020
Mark Fausel Date
Department Supervisor

Facility Distribution No. Electronic **Distributed To: Facility Intranet**

1.0 Scope and Application

This SOP describes the laboratory procedure for the preparation and analysis of per- and polyfluorinated substances using liquid chromatography/tandem mass spectrometry (LC/MS/MS).

Program specific requirements are not included in this SOP. The details of program specific requirements are specified in other laboratory work instructions relevant to the program.

1.1 Analytes, Matrices, and Reporting Limits

This procedure is amenable with water, soil, sediment and tissue sample matrices.
The list of target compounds that may be determined from this procedure is provided below. Table 1 presents the compounds along with their associated reporting limits (RL).

Compound Name	Abbreviation	CAS #
Perfluoroalkylcarboxylic acids (PFCAs)		
Perfluoro-n-butanoic acid (Perfluoro-n-butyric acid)	PFBA	375-22-4
Perfluoro-n-pentanoic acid	PFPeA	2706-90-3
Perfluoro-n-hexanoic acid	PFHxA	307-24-4
Perfluoro-n-heptanoic acid	PFHpA	375-85-9
Perfluoro-n-octanoic acid	PFOA	335-67-1
Perfluoro-n-nonanoic acid	PFNA	375-95-1
Perfluoro-n-decanoic acid	PFDA	335-76-2
Perfluoro-n-undecanoic acid	PFUdA (PFUnA)	2058-94-8
Perfluoro-n-dodecanoic acid	PFDoA	307-55-1
Perfluoro-n-tridecanoic acid	PFTrDA	72629-94-8
Perfluoro-n-tetradecanoic acid	PFTeDA (PFTA)	376-06-7
Perfluoro-n-hexadecanoic acid	PFHxDA	67905-19-5
Perfluoro-n-octadecanoic acid	PFODA	16517-11-6
Perfluorinated sulfonic acids (PFSAs)		
Perfluoro-1-butanesulfonic acid	PFBS	375-73-5
* Perfluoro-1-pentanesulfonic acid	PFPeS	2706-91-4
Perfluoro-1-hexanesulfonic acid	PFHxS	355-46-4
Perfluoro-1-heptanesulfonic acid	PFHpS	375-92-8
Perfluoro-1-octanesulfonic acid	PFOS	1763-23-1
* Perfluoro-1-nonanesulfonic acid	PFNS	68259-12-1
Perfluoro-1-decanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5
Perfluorinated sulfonamides (FOSA)		
Perfluoro-1-octanesulfonamide	FOSA	754-91-6
Perfluorinated sulfonamidoacetic acids (FOSAA)		
N-ethylperfluoro-1-octanesulfonamidoacetic acid	EtFOSAA	2991-50-6
N-methylperfluoro-1-octanesulfonamidoacetic acid	MeFOSAA	2355-31-9
Fluorotelomer sulfonates (FTS)		
* 1H,1H,2H,2H-perfluorohexanesulfonic acid *(4:2)*	4:2 FTS	757124-72-4
1H,1H,2H,2H-perfluorooctanesulfonic acid *(6:2)*	6:2 FTS	27619-97-2

1H,1H,2H,2H-perfluorodecanesulfonic acid *(8:2)*	8:2 FTS	39108-34-4
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2)	10:2 FTS	120226-60-0
Fluorinated Replacement Chemicals		
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
4,8-dioxa-3H-perfluorononanoic acid	DONA	919005-14-4
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	F53B Major (9Cl-PF3ONS)	756426-58-1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	F53B Minor (11Cl-PF3OUdS)	763051-58-1

Abbreviations in parenthesis are the abbreviations listed in Method 537, where they differ from the abbreviation used by the laboratory's LIMS.
***Indicates the analyte is not certified in any state or program.**
Note: Analytes with secondary certification in NJDEP can be found in Appendix D and samples collected in New Jersey are only approved for non-potable water.

The working range of the method is listed below. The linear range can be extended by diluting the extracts.

Matrix	Nominal Sample Size	Reporting Limit	Working Range
Water	250 mL	2.0 ng/L - 5 ng/L	2.0 ng/L - 400 ng/L
Soil/Sediment	5 g	0.2 µg/Kg–0.5 µg/Kg	0.2 µg/Kg-40 µgKg
Tissue	1 g	1.0 µg/Kg–10 µg/Kg	1.0 µg/Kg–200 µg/Kg

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in the Quality Assurance Manual.

2.0 Summary of Method

Water Samples: Water samples are extracted using a solid phase extraction (SPE) cartridge. PFAS are eluted from the cartridge with an [redacted] solution.

Soil/sediment/tissue samples are extracted with a [redacted] solution using a TCLP tumbler operating at [redacted]. The mixture is centrifuged to reduce the amount of solid transferred when decanting the solvent. The solvent extract is exchanged to water using nitrogen blowdown, then the aqueous extract is extracted using a solid phase extraction (SPE) cartridge. PFAS are eluted from the cartridge with an ammonium hydroxide/methanol solution.

The final [redacted] extracts are analyzed by LC/MS/MS operated in electrospray (ESI) negative ion mode. PFAS are separated from other components on a C18 column with a solvent gradient program [redacted] and methanol.

An isotope dilution technique is employed with this method for the compounds of interest. The isotope dilution analytes (IDAs) consist of carbon-13 labeled analogs, oxygen-18 labeled analogs, or deuterated analogs of the compound of interest, and they are spiked into the samples at the time of extraction. This technique allows for the correction for analytical bias encountered when analyzing more chemically complex environmental samples. The isotopically labeled compounds are chemically similar to the compounds of concern and are therefore affected by sample-related interferences to the same extent as the compounds of concern. Compounds that do not have an

identically labeled analog are quantified by the IDA method using a closely related labeled analog.

Quantitation by the internal standard method is employed for the IDA analytes/recoveries. Peak response is measured as the area of the peak.

This SOP is based on the following reference methods:

- US EPA, "Method 537 - Determination of Selected Perfluorinated alkyl acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometery (LC/MS/MS)", Version 1.1, September 2009.
- Method ISO 25101, "Water quality – Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) – Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry", First Edition, 2009-03-01, International Organization for Standardization, Technical Committee ISO/TC 147, Water Quality, Subcommittee SC 2, Physical, chemical and biochemical methods.

If the laboratory's SOP is modified from the reference method, a list of method modifications along with technical justification may be found in Section 16. Modifications to this SOP may be applied on a project specific basis to meet project data quality objectives. Project specific modifications are documented in the project record.

3.0 Definitions

Refer to the Laboratory's Quality Assurance Manual (QAM) for the Glossary of Terms, Definitions and Acronyms except as follows.

Definitions of terms used in this SOP may be found in Appendix A.

4.0 Interferences

PFAS have been used in a wide variety of manufacturing processes, and laboratory supplies should be considered potentially contaminated until they have been tested and shown to be otherwise. The materials and supplies used during the method validation process have been tested and shown to be clean. These items are listed below in Section 6.

To avoid contamination of samples, standards are prepared in a ventilation hood in an area separate from where samples are extracted.

PTFE products can be a source of PFOA contamination. The use of PTFE in the procedure should be avoided or at least thoroughly tested before use. Polypropylene (PP) or polyethylene (PE, HDPE) products may be used in place of PTFE products to minimize PFOA contamination.

Standards and samples are injected from polypropylene autosampler vials with polyethylene screw caps once. Multiple injections may be performed on Primers when conditioning the instrument for analysis.

Random evaporation losses have been observed with the polyethylene caps causing high IDA recovery after the vial was punctured and sample re-injected. For this reason, it is best to inject standards and samples once in the analytical sequence.

Teflon-lined screw caps have detected PFAS at low concentrations. Repeated injection from the

same Teflon-lined screw cap have detected PFNA at increasing concentration as each repeated injection was performed, therefore, it is best to use polyethylene screw caps.

Volumetric glassware and syringes are difficult to clean after being used for solutions containing high levels of PFAS. These items should be labeled for use only with similarly concentrated solutions or verified clean prior to re-use. To the extent possible, disposable labware is used.

Both branched and linear isomers of PFOS, PFOA, PFHxS, PFBS, EtFOSAA and MeFOSAA can potentially be found in the environment, based upon scientific literature. If multiple isomers are present for one of these PFAS, these adjacent peaks are either completely resolved or not resolved but with a profound deflection that can be resolved during peak integration. The later of the peaks matches the retention time of the single labeled PFAS peak. In general, earlier peaks are branched isomers and are not a result of peak splitting, and all the chromatographic peaks observed in the standard and/or sample must be integrated and the areas included.

When reference standards of technical mixtures of specific PFAS area available, they should be used to ensure that all appropriate peaks are included during peak integration (at this time, only PFOS, PFOA, PFHxS, EtFOSAA and MeFOSAA are available as technical mixtures). Refer to Section 7, Reagents, for the available technical mixtures utilized by this SOP.

In an attempt to reduce PFOS bias, it is required that m/z 449>80 transition be used as the quantitation transition.

Per the Certificate of Analysis for labeled perfluorohexadecanoic acid (13C2-PFHxDA) produced by Wellington Laboratories, the stock standard contains roughly 0.3% of native perfluorohexadecanoic acid. The laboratory utilizes a weighted linear regression that is not forced through the origin for the calibration of native perfluorohexadecanoic acid to account for this contribution from its labeled IDA.

5.0 Safety

Employees must abide by the policies and procedures in the NDSC Eurofins TestAmerica Laboratories Environmental Health and Safety Manual (CW-E-M-001), and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1 Specific Safety Concerns or Requirements

Preliminary toxicity studies indicate that PFAS could have significant toxic effects. In the interest of keeping exposure levels as low as reasonably achievable, PFAS must be handled in the laboratory as hazardous and toxic chemicals.

Exercise caution when using syringes with attached filter disc assemblies. Application of excessive force has, upon occasion, caused a filter disc to burst during the process.

Laboratory procedures such as the use of pipets and transferring of extracts represent a significant potential for repetitive motion or other ergonomic injuries. Laboratory associates performing these procedures are in the best position to realize when they are at risk for these types of injuries. Whenever a situation is found in which an employee is performing the same

repetitive motion, the employee shall immediately bring this to the attention of their supervisor, manager or the EH&S staff. The task will be analyzed to determine a better means of accomplishing it.

Eye protection that satisfies ANSI Z87.1 (as per the Eurofins TestAmerica Corporate Safety Manual), a laboratory coat and nitrile gloves must be worn while handling samples, standards, solvents and reagents. Disposable gloves that have been contaminated will be removed and discarded; other gloves will be cleaned immediately.

Perfluorocarboxylic acids are acids and are not compatible with strong bases.

The use of vacuum systems presents the risk of imploding glassware. All glassware used during vacuum operations must be thoroughly inspected prior to each use. Glass that is chipped, scratched, cracked, rubbed or marred in any manner must not be used under vacuum. It must be removed from service and replaced.

The HPLC and MS/MS have areas of high voltage. Depending on the type of work involved, the instrument should be turned off or disconnected from its source of power prior to extensive maintenance.

5.2 Primary Materials Used

Table 2 lists those materials used in this procedure that have a serious or significant hazard rating along with the exposure limits and primary hazards associated with that material as identified in the SDS. **NOTE: This list does not include all materials used in the method.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

6.0 Equipment and Supplies

Catalog numbers listed in this SOP are subject to change at the discretion of the vendor. Analysts are cautioned to be sure equipment used meets the specification of this SOP.

6.1 Miscellaneous

- 15 mL polypropylene test tubes with screw caps, Fisherbrand 05-539-5 or equivalent.
- 250-mL HDPE wide-mouth bottles with screw caps (ESS 0250-1901-).
- Analytical balance capable of weighing to the nearest 0.01g, and checked for accuracy each day it is used in accordance with BR-GT-008.
- SPE Vacuum manifold, 24-port, [redacted] or equivalent.
- 1/8” OD Poly siphon lines, 30” long for sample loading.
- SPE Adaptor Caps for 1, 3, and 6 mL SPE Tubes, Polyethylene, [redacted] or equivalent.
- SPE Stopcocks, Polyethylene and Polypropylene, [redacted] or equivalent.
- Stainless steel solvent guide needles, [redacted], or equivalent.
- Heavy-Wall filter flask, Fisherbrand 4000mL, [redacted] or equivalent.
- TCLP tumbler, [redacted] for extraction of soil, sediment and tissue samples.
- Glass-Col ZipVap 24-port extract concentrator.

- Polypropylene Syringe, 10 mL with luer-lok or luer slip tips, [redacted] or equivalent.
- Volumetric Syringes, Class "A" (25µL, 50µL 100µL, and 500µL), Hamilton or equivalent.
- Automatic Pipettor, Finnpette, 1-5mL.
- Polypropylene autosampler vials, 300µL, 700µL and 2mL with polyethylene screw caps.
- Waters Oasis [redacted] or equivalent, for the extraction of PFAS from aqueous samples.
- Waters Oasis [redacted] or equivalent, for the cleanup of soils.
- 250mL Poly bottles containing 1.25g of Trizma Pre-Set Crystals, used for batch QC for samples received with Trizma preservation.
- 50mL graduated polypropylene centrifuge tubes. [redacted] or equivalent.
- 500ml Polyethylene wash bottle
- 4, 6, and 12ml Class A Volumetric Pipette
- Graphitized carbon (Envi-Carb™ or equivalent)
- Miscellaneous laboratory apparatus (beakers, test tubes, volumetric flasks, pipettes, etc). These should be disposable wherever possible, or marked and segregated for high-level versus low-level use.

6.2 Analytical System

Liquid Chromatography/Tandem Mass Spectrometer (LC/MS/MS)-as described below. The use of a column heater is required to maintain a stable temperature throughout the analytical run. Data is processed using Chrom Peak Review, version 2.1 or equivalent.

- SCIEX LC/MS/MS
  This system consists of a [redacted] HPLC interfaced with a [redacted] The instrument control and data acquisition software is [redacted] equivalent.

  [redacted] HPLC equipped with [redacted] and one [redacted] or equivalent. [redacted] Column Oven.

  [redacted] or equivalent.

  PFAS Isolator column. [redacted]. These are plumbed between the pump's mixing valve and the autosampler to minimized the HPLC-based PFAS background from injection-based PFAS.

7.0 Reagents and Standards

7.1 Reagents

All reagents must follow traceability guidelines found in SOP BR-QA-002.

- Ammonium acetate Stock Solution, [redacted]
- [redacted] ammonium acetate eluent.. [redacted]

- Ammonium hydroxide, concentrated, JT Baker or equivalent.
- Ammonium hydroxide (NH_4OH) [redacted] of Methanol. Volume prepared may be adjusted based on usage/need.
- Potassium hydroxide pellets, 87% purity, JT Baker P250-1 or equivalent.
- Potassium hydroxide (KOH), [redacted]
- Reagent Water, house reverse-osmosis reagent water ("PFAS-Free" via in-house testing).
- Hexane, Ultra-Resi Analyzed, JT Baker or equivalent.
- Methanol, HPLC JT Baker or equivalent.
- Sodium hydroxide, pellets, JT Baker or equivalent.
- Sodium hydroxide (NaOH), [redacted]
- Acetonitrile, Optima Grade, Fisherbrand or equivalent.

7.2 Standards

Purchase high purity, technical grade solids (96% or greater) or certified solutions from commercial vendors. Standard materials are verified compared to a second source material at the time of initial calibration. The solid stock material is stored at room temperature or as specified by the manufacturer or vendor. If solid material is used for preparing a standard, stock standard solutions are prepared from the solids and are stored at 4 ± 2°C. Stock standard solutions should be brought to room temperature before using. Standards are monitored for signs of degradation or evaporation. Standard solutions must be replaced at least annually from the date of preparation.

Per the Certificate of Analysis for labeled perfluorohexadecanoic acid (13C2-PFHxDA) produced by Wellington Laboratories, the stock standard contains ~0.3% of native PFHxDA. This equates to roughly 0.30 ng/L or 0.015 ug/Kg of PFHxDA expected in all samples and blanks.

As of this writing, only PFOS, PFOA, PFHxS, MeFOSAA and EtFOSAA are commercially available as technical mixtures. These reference standards of the technical mixtures for these specific PFAS are used to ensure that all appropriate peaks are included during peak integration.

PFBS, PFHxS, PFHpS, PFOS, PFDS, and many other PFAS are not available in the acid form, but rather as their corresponding salts, such as sodium or potassium. The standards are prepared and corrected for their salt content according to the equation below.

$$Mass_{acid} = \text{Measured } Mass_{salt} \times MW_{acid} / MW_{salt}$$

Where: MW_{acid} is the molecular weight of PFAA

MW_{salt} is the molecular weight of the purchased salt.

For example, the molecular weight of PFOS is 500.1295 and the molecular weight of NaPFOS is 523.1193. Therefore, the amount of NaPFOS used must be multiplied by a factor of 0.956 to account for the amount of PFOS in the final solution.

While PFAS standards commercially purchased are supplied in glass ampoules, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene or HDPE containers.

Prepare calibration and working standards by diluting a known volume of stock standard in an appropriate solvent to the final volume needed to achieve the desired concentration. The

recommended formulation for each standard used in this procedure is provided in Appendix B along with the recommended source materials, expiration dates and storage conditions.

A technical (qualitative) grade PFOA standard is analyzed initially, then after initial calibration when a new column is installed or when significant changes are made to the HPLC parameters. This solution is used as a reference for the PFOA isomers (branched and linear) retention times.

A second source solution for PFAS is purchased from the same vendor; the PFC-MXB contains most of the target analytes in this mixture and is used as an ICV. For those compounds not available in this mixture or are not available from another vendor, a second analyst may prepare a second source standard from the same source as the ICAL to produce an ICV. The recommended concentration of the ICV standard should be in the mid-range of the calibration curve. The concentration may be adjusted if the initial calibration levels are changed or altered. The IDA and ISTD are added at a fixed concentration (2.5 ng/mL in extract).

7.3 Extraction Spiking Solutions

PFAS LCS/Matrix Spike Solution, 400 ng/mL

The PFAS spike solution is prepared by diluting all PFAS to produce a solution containing each PFAS at a concentration of 400 ng/mL in methanol.

PFAS High Level LCS Solution, 1000 ng/mL

The PFAS spike solution is prepared by diluting all PFAS to produce a solution containing each PFAS at a concentration of 1000 ng/mL in methanol.

PFAS Isotope Dilution Analyte Solution, 500 ng/mL

The PFAS-IDA solution is prepared by diluting all labeled PFAS to produce a solution containing each IDA compound at a concentration of 1000 ng/mL in methanol.

Internal Standard Solution, $^{13}C_2$-PFOA, 1250 ng/mL

The internal standard solution is prepared by diluting the stock 50 µg/mL $^{13}C_2$-PFOA 20-fold in methanol.

See Appendix B for analyte lists and concentrations.

8.0 Sample Collection, Preservation, Shipment and Storage

The laboratory does not perform sample collection so these procedures are not included in this SOP, sampling requirements may be found in the published reference method.

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Minimum Sample Size	Preservation	Holding Time[1]	Reference
Water	250 mL HDPE Bottle	250 mL	0-6°C, Trizma (5g/L) (if from a known	14 days from collection	Method 537

			chlorinated source)		
Soil/Sediment	4/8 oz HDPE wide-mouth container	100 g	0-6°C	14 days from collection	SW-846 Organic Methods
Extract	700 µL Polypropylene (PP) Vial with HDPE Screw cap	NA	0-6°C	40 days from extraction (28 days from extraction for samples collected in NJ)	NJDEP guidance

[1]*Extraction holding time is calculated from date of collection. Analytical holding time is determined from date of extraction.*

Unless otherwise specified by client or regulatory program, after analysis, samples and extracts are retained for a minimum of 30 days after provision of the project report and then disposed of in accordance with applicable regulations.

9.0 Quality Control

Sample QC

When samples contain the preservative Trizma, all associated QC must be treated with the same preservative.

Initial Demonstration of Capability (IDOC) and Method Detection Limit (MDL) studies described in Section 12 must be acceptable before analysis of samples may begin.

Batches are defined at the sample preparation step. Batches should be kept together through the whole analytical process as far as possible, but it is not mandatory to analyze prepared extracts on the same instrument or in the same sequence.

The laboratory prepares the following sample QC for each extraction batch (an extraction batch is limited to a maximum of 20 field samples of the same matrix processed using the same procedure and reagents within the same time period):

QC Item	Frequency	Acceptance Criteria
Method Blank (MB)	1 per extraction batch	See Table 3
Laboratory Control Sample (LCS)	1 per extraction batch (Spiking Level rotates between Low, Medium and High on a batch-by-batch basis)	See Table 3
LCS Duplicate (LCSD)	1 per extraction batch whenever insufficient sample is available for an MS/MSD/DU	See Table 3
*Matrix Spike (MS/MSD)	1 per extraction batch (if sufficient sample is available)	See Table 3
*Sample Duplicate (SD)	DW-1 per extraction batch (if sufficient sample is available); Non-DW matrices- client request	See Table 3

	if sufficient sample is available	
Field Reagent Blank, FRB	Per client set of samples	See Table 3

*An NCM must be applied if there is insufficient volume for a MS/MSD or duplicate.

Instrument QC

The following instrument QC is performed:

QC Item	Frequency	Acceptance Criteria
Initial Calibration (ICAL)	Initially, when CCV fails and after major instrument maintenance	See Table 3
Initial Calibration Blank (ICB)	Immediately after ICAL	See Table 3
Second Source Verification (ICV)	Immediately after ICB	See Table 3
Continuing Calibration Verification (CCV)	Beginning, end and after every 10 field samples. Alternate between ICAL Levels 4 and 5 (in order) throughout sequence	See Table 3
Continuing Calibration Verification Low (CCVL)	Immediately prior to Level 4 CCV at beginning of every non-ICAL analytical sequence	See Table 3
Isotope Dilution Analytes (IDA)	Added to Every injection (Standards, QC and Field Samples) at the same concentration	See Table 3

10.0 Procedure

One-time procedural variations are allowed only if deemed necessary in the professional judgment of a supervisor to accommodate variation in sample matrix, chemistry, sample size, or other parameters. Any variation in procedure shall be completely documented using a Non-Conformance Memo (NCM). The NCM process is described in more detail in SOP BR-QA-016. The NCM shall be filed in the project file and addressed in the case narrative. ***Any deviations from this procedure identified after the work has been completed must be documented in an NCM, with a cause and corrective action described.***

10.1 Water Sample Preparation

Visually inspect samples for the presence of settled and/or suspended sediment. If the amount of sediment is so great that the SPE cartridge will clog before the majority of the sample has eluted, filter the water sample through a glass fiber filter [redacted] or equivalent). Gravity or vacuum can be used to pass the sample through the filter. Prepare a filtration blank and LCS with any samples requiring filtration. File an NCM noting the need for filtration.

> Warning: The use of a vacuum system creates the risk of glassware implosion. Inspect all glassware prior to use. Glassware with chips, scratches, rub marks or cracks must not be used.

Due to the high surface activity of the analytes, filtration should be regarded as a last resort. All samples will be spiked with IDA prior to filtration (if enough sample is available, perform an MS on each sample); this will allow any losses caused by filtration to be monitored and corrected for.

NOTE: for samples which full volume extraction is not possible, care MUST be taken to ensure the actual sample volume that is both spiked and extracted are documented in the sample worksheet notes.

Prepare two 250 mL aliquots of HPLC-grade water for the method blank and LCS.

Rotate the LCS concentration with each batch.

-Low Level LCS (50-150 %R), spike with 0.50 mL of PFAS LOQV solution. This will result in sample concentrations at the method Reporting Limit.

-Medium Level LCS (70-130 %R), spike with 0.025 mL (25 µL) of the PFAS LCS/Matrix Spike solution (Section 7.2). This will result in a sample concentration of 40 ng/L.

-High level LCS (70-130 %R), spike at 0.05mL (50uL) of the PFAS High Level LCS Spike solution (Section 7.2). This will result in a sample concentration of 200 ng/L.

Spike the MS/MSD (if available volume) with 0.025 mL (25 µL) of the PFAS LCS/Matrix Spike solution (Section 7.2). This will result in a sample concentration of 40 ng/L. NCM if there is insufficient volume to perform the MS/MSD.

Add [redacted] of the PFAS-IDA solution (Section 7.2) into each sample and QC sample, for a fixed concentration of 1.25 ng/mL in extract.

Due to the surface active nature of the PFAS analytes, it is necessary to extract the entire sample as well as the container walls to maximize recovery. It is therefore ideal to receive full 250 mL HDPE bottles for each sample (and MS/MSD if sufficient volume is received) so the entire sample can be processed from that container.

Weigh each container to determine its pre-extraction mass (Gross Weight). Spike each container in the batch with PFAS-IDA solution. Spike the LCS and LCSD (or MS/MSD, if available volume) with PFAS LCS/Matrix solution. Shake to mix the contents. After the extraction has been completed, allow the container to completely dry (uncapped). Replace the cap and reweigh the container to determine the container mass (Tare Weight). The sample volume extracted can be determined by subtracting the Tare Weight from the Gross Weight. These calculations are captured in the PFAS water sample prep module (TALS Method 3535_IVWT and 25101_2009_SPE).

10.1.1 Solid Phase Extraction (SPE) of Aqueous Samples

Condition the SPE cartridges [redacted] by passing the following without drying the column.

WARNING: The use of a vacuum system creates the risk of glassware implosion. Inspect all glassware prior to use. Glassware with chips, scratches, rub marks or cracks must not be used.

Wash with 5.0 mL of [redacted]

Wash with 5.0 mL of [redacted] Close valve when ~ 1 mL remains on top to keep column wet. After this step, the columns should not go dry until the completion of loading and rinsing samples.

Appropriately label the SPE cartridges.

Add a poly siphon line to an adapter which has been firmly inserted into the SPE cartridge and place the other end of the line into the corresponding sample container.

Turn on the vacuum and pull the entire sample volume (minimum of 250 mL) through the cartridge at rate of approximately [redacted]

Stop the sample elution when ~0.1 mL remains. Add ~5 mL of water to the SPE column and restart the elution to complete the loading process. The added water volume ensures there are no small sample droplets remaining that may be clinging to the wall of the SPE cartridge.

After the sample and water rinse has passed through the cartridge, allow the cartridge to completely dry with vacuum (this could take up to 90 minutes). The cartridge should return to a uniform color. NOTE: Remove and replace each cartridge during the drying process to ensure any water droplets that may be in the flow path are eliminated.

10.1.2 SPE Column Wash of Aqueous Samples with Hexane

Add [redacted] to each SPE column and let the column become fully saturated with solvent. Close the stopcock and allow the column to soak for five minutes, then elute to waste.

Load a second [redacted] and elute to waste (without a soaking period).

Allow the column to dry with vacuum for 5 to 10 minutes. Columns must be dried thoroughly before continuing. The cartridge should return to a uniform color. Wipe any remaining water droplets from the bottom of the stainless steel guide needles using a fresh Kimwipe for each needle prior to proceeding to the next step.

10.1.3 SPE Elution of Aqueous Samples

Note: The use of glass should be avoided where able. However, disposable glass pipettes have a much narrower opening, which is necessary to reduce spillage during the following transfer steps.

Place labeled 15 mL polypropylene test tubes containing [redacted] of Reagent Water as receiving tubes in the SPE manifold.

Rinse the dried sample bottles with [redacted] and transfer to the corresponding SPE cartridge using a disposable glass pipet (NOTE: the sample container has molded ridges in the neck that can trap up to 0.5mL of the solvent rinsate; make sure to tip the container slightly to draw the rinsate out of the ridges). Allow the solution to soak the cartridge for 5 minutes and then elute into the 15 mL collection tube.

Repeat the sample bottle rinse to cartridge elution process with a [redacted] (without the soaking period). The total collection should be approximately 10 mL. Adjust to 10 mL with methanol.

10.1.4 Sample Cleanup with Graphitized Carbon (Optional)

Note: If this step is to be performed, do not add the [redacted] to the receiving tubes prior to extract collection. Add [redacted] of graphitized carbon to each sample extract and QC extracts to aid in the removal of organic interferences. Shake vigorously and then let sit for 10 minutes. Centrifuge each sample for 2 minutes at 1000 rpm. Decant the solvent layer into a new 15mL centrifuge tube containing 2 mL of Reagent Water and swirl to mix. Adjust the volume to 10 mL with methanol.

10.1.5 Internal Standard Addition

Add [redacted] internal standard to each extract and vortex to mix well.

Transfer a portion of the extract to a labeled 300µL polypropylene autosampler vial (6 drops or approximately 60µL). Archive the rest of the extract in the event the sample needs re-injection and/or dilution.

Seal the vials with polyethylene screw caps. Note: Teflon lined caps may not be used due to detection of low level concentration of PFAS.

10.2 Soil Sample Preparation

Visually inspect soil samples for homogeneity. Weigh a representative 5 g aliquot of soil, sediment or 1 g of tissue sample into a 50 mL centrifuge tube. Weigh additional sample amounts for the matrix spike and matrix spike duplicate analyses if they are requested and enough sample mass is available. Weigh 5 g aliquots of Ottawa sand or 0.1 g of oil for the MB and LCS samples.

Spike the LCS and MS/MSD (if requested) with 25 µL LCS/Matrix Spike Solution. This will result in a sample concentration of 2.0 ng/g (1.0 ng/mL ext).

Add [redacted] of IDA PFC Spiking Solution into each sample and QC sample, for a fixed concentration of 1.25 ng/mL in the final sample vial.

Cap the sample tubes and allow the spikes to settle into the sample matrix. Gently shake the bottles to mix the spike into the matrix.

Add [redacted] to each sample. Cap each sample and shake lightly to confirm container is sealed.

Place all samples in the prep batch into the TCLP tumbler and tumble for 3 hours.

After removing the samples from the tumbler, gently shake each container to confirm the solid material has settled to the bottom of the centrifuge tube, then place in a sonic bath for 12 hours.

Centrifuge each sample at 3500 rpm for 15 minutes.

Transfer the supernate (solvent) to a second, labeled 50 mL centrifuge tube containing 2 mL of Reagent Water.

Slowly add [redacted] to original 50 mL extraction tube. Pour the 2 mL of solvent rinse into the second labeled tube to complete the quantitative transfer.

Place extracts in the ZipVap set to 60 C for ~3 hours with nitrogen flow just strong enough to gently ripple the surface of the extracts. The concentration step is complete when the final volume either gets below 2 mL or maintains at the same level after consecutive checks a 5 minute intervals (this may be due to sample-based moisture contributing to the amount of water in the extract). Remove the sample from the ZipVap when the concentration has completed and allow the extracts to cool.

Adjust the volume of each sample's extract to 15 mL with Reagent Water and add 75 uL of Glacial Acetic Acid to neutralize the solution to pH 6-8. If the extracts contain suspended solids, centrifuge them at 3500 rpm for 15 minutes.

10.2.1 Solid Extract Cleanup by SPE

Condition the SPE cartridges [redacted] by passing the following without drying the column.

Wash with [redacted] with [redacted] Wash with a second [redacted] followed by a second [redacted] Close valve when ~ 0.5 mL remains on top to keep column wet. After this step, the columns should not go dry until the completion of loading and rinsing samples.

Appropriately label the SPE cartridges.

Pour each aqueous sample extract into its corresponding SPE cartridge until it is filled. Turn on the vacuum and open the stopcock to load the sample onto the cartridge. Add the remaining extract to the cartridge before it goes dry and stop the flow just before all of the sample has been drawn into the media. [redacted] 50 mL centrifuge tube to rinse the tube and complete the quantitative transfer. Pour this rinse into the SPE cartridge and open the stopcock to load the rest of the rinsate onto the cartridge. The added water volume ensures there are no small sample droplets remaining that may be clinging to the wall of the SPE cartridge. Set the centrifuge tubes aside and allow them to completely dry.

After the sample and water rinse has passed through the cartridge, allow the cartridge to completely dry with vacuum (this could take up to 30 minutes). The cartridge should return to a uniform color. NOTE: Remove and replace each cartridge during the drying process to ensure any water droplets that may be in the flow path are eliminated.

10.2.2 SPE Column Wash of Solid Extracts with Hexane

Add [redacted] of hexane to each SPE column and let the column become fully saturated with solvent. Close the stopcock and allow the column to soak for five minutes, then elute to waste.

Load a second [redacted] of hexane and elute to waste (without a soaking period).

Allow the column to dry with vacuum for 5 to 10 minutes. Columns must be dried thoroughly before continuing. The cartridge should return to a uniform color. Wipe any remaining water droplets from the bottom of the stainless steel guide needles using a fresh Kimwipe for each needle prior to proceeding to the next step.

10.2.3 SPE Elution of Solid Extracts

Place labeled 15 mL polypropylene test tubes containing [redacted] as receiving tubes in the SPE manifold.

Rinse the dried sample tubes [redacted] and transfer to the corresponding SPE cartridge. Allow the solution to soak the cartridge for 5 minutes and then elute into the 15 mL collection tube.

Repeat sample bottle rinse to cartridge elution process with [redacted] (without the soaking period) The total collection should be approximately 10 mL. Adjust to 10 mL

with methanol.

10.2.4 Sample Cleanup with Graphitized Carbon (Optional)

Note: If this step is to be performed, do not add the [redacted] to the receiving tubes prior to extract collection. Add [redacted] of graphitized carbon to each sample extract and QC extracts to aid in the removal of organic interferences. Shake vigorously and then let sit for 10 minutes. Centrifuge each sample for 2 minutes at 1000 rpm. Decant the solvent layer into a new 15mL centrifuge tube containing 2 mL of Reagent Water and swirl to mix. Adjust the volume to 10 mL with methanol.

10.2.5 Internal Standard Addition

Add [redacted] internal standard to each extract and vortex to mix well.

Transfer a portion of the extract to a labeled 300µL polypropylene autosampler vial (6 drops or approximately 60µL). Archive the rest of the extract in the event the sample needs re-injection and/or dilution.

Seal the vials with polyethylene screw caps. Note: Teflon lined caps may not be used due to detection of low level concentration of PFAS.

10.3 Instrument Operating Conditions

Suggested operating conditions are listed below for the [redacted] LCMS system:

Recommended Instrument Operating Conditions					
HPLC Conditions (Shimadzu HPLC)					
Column (Column temp = 45°C)	Phenomenex Gemini C18 3um, 3.0mm x 100mm				
Mobile Phase Composition	A=20mM Ammonium Acetate (90/10 water/methanol) B=Methanol				
Gradient Program	**Time**	**%A**	**%B**	**Curve**	**Flow Rate mL/min.**
	[redacted]			6	0.60
				6	0.60
				6	0.60
				6	0.60
				6	0.60
				6	0.60
	Maximum pressure limit = 5,000 psi				
Injection Size	[redacted]				
Run Time	[redacted]				
Mass Spectrometer Interface Settings (Sciex 5500 QQQ)					
MS Interface Mode	[redacted]				
Ionspray (volts)	[redacted]				
Declustering Potential-DP (volts)	[redacted]				
Entrance Potential-EP (volts)	[redacted]				

Source Temp (TEM)	[redacted]
Curtain Gas (CUR)	[redacted]
Collision Gas (CAD)	[redacted]
Ion Source Gas 1 (GS1)	
Ion Source Gas 2 (GS2)	
Collision Energy-CE (volts)	
Collision Cell Exit Potential-CXP (volts)	

Recommended Instrument Operating Conditions

Mass Spectrometer Scan Settings [redacted]

Compound	Comments	Reaction (MRM)	Dwell (sec)	DP(v)	EP(v)	CE(v)	CXP(v)
PFBA	Native analyte	212.9 > 169.0	0.011				
13C4 PFBA	IDA	217.0 > 172.0	0.011				
PFPeA	Native analyte	262.9 > 219.0	0.011				
13C5 PFPeA	IDA	267.9 > 223.0	0.011				
PFBS	Native analyte	298.9 > 80.0	0.011				
PFBS_2	Native analyte	298.9 > 99.0	0.011				
13C3 PFBS	IDA	301.9 > 80.0	0.011				
PFHxA	Native analyte	313.0 > 269.0	0.011				
PFHxA_2	Native analyte	313.0 > 119.0	0.011				
13C2 PFHxA	IDA	315.0 > 270.0	0.011				
4:2FTS	Native analyte	327.0 > 307.0	0.011				
M2-4:2FTS	IDA	329.0 > 81.0	0.011				
PFPeS	Native analyte	349.0 > 80.0	0.011				
PFPeS_2	Native analyte	349 > 99.0	0.011				
HFPO-DA	Native analyte	329.1 > 285	0.011				
13C3 HFPO-DA	IDA	332.1 > 287	0.011				
PFHpA	Native analyte	363.0 > 319.0	0.011				
PFHpA_2	Native analyte	363.0 > 169.0	0.011				
13C4 PFHpA	IDA	367.0 > 322.0	0.011				
PFHxS	Native analyte	399.0 > 80.0	0.011				
PFHxS_2	Native analyte	399.0 > 99.0	0.011				
18O2 PFHxS	IDA	403.0 > 84.0	0.011				
DONA	Native analyte	377 > 251	0.011				
DONA_2	Native analyte	377 > 85	0.011				
PFOA	Native analyte	413.0 > 369.0	0.011				
PFOA_2	Native analyte	413.0 > 169.0	0.011				
13C2 PFOA	Internal Std	415.0 > 370.0	0.011				
13C4 PFOA	IDA	417.0 > 372.0	0.011				
6:2FTS	Native analyte	427.0 > 407.0	0.011				
M2-6:2FTS	IDA	429.0 > 81.0	0.011				
PFHpS	Native analyte	449.0 > 80.0	0.011				
PFHpS_2	Native analyte	449.0 > 99.0	0.011				
PFNA	Native analyte	463.0 > 419.0	0.011				
PFNA_2	Native analyte	463.0 > 169.0	0.011				

13C5 PFNA	IDA	468.0 > 423.0	0.011	[redacted]
PFOS	Native analyte	499.0 > 80.0	0.011	
PFOS_2	Native analyte	499.0 > 99.0	0.011	
9Cl-PF3ONS	Native analyte	531 > 351	0.011	
13C4 PFOS	IDA	503.0 > 80.0	0.011	
PFDA	Native analyte	513.0 > 469.0	0.011	
PFDA_2	Native analyte	513.0 > 169.0	0.011	
13C2 PFDA	IDA	515.0 > 470.0	0.011	
8:2FTS	Native analyte	527.0 > 507.0	0.011	
M2-8:2FTS	IDA	529.0 > 81.0	0.011	
PFNS	Native analyte	549.0 > 80.0	0.011	
PFNS_2	Native analyte	549.0 > 99.0	0.011	
MeFOSAA	Native analyte	570 > 419.0	0.011	
d3-MeFOSAA	IDA	573.0 > 419.0	0.011	
11Cl-PF3OUdS	Native analyte	631 > 451	0.011	
FOSA	Native analyte	498.0 > 78.0	0.011	
13C8 FOSA	IDA	506.0 > 78.0	0.011	
PFUdA	Native analyte	563.0 > 519.0	0.011	
PFUdA_2	Native analyte	563.0 > 169.0	0.011	
13C2 PFUdA	IDA	565.0 > 520.0	0.011	
EtFOSAA	Native analyte	584.0 > 419.0	0.011	
d5-EtFOSAA	IDA	589.0 > 419.0	0.011	
PFDS	Native analyte	599.0 > 80.0	0.011	
PFDS_2	Native analyte	599.0 > 99.0	0.011	
PFDoA	Native analyte	613.0 > 569.0	0.011	
PFDoA_2	Native analyte	613.0 > 169.0	0.011	
13C2 PFDoA	IDA	615.0 > 570.0	0.011	
10:2FTS	Native analyte	627 > 607	0.011	
PFDoS	Native analyte	699 > 80	0.011	
PFDoS_2	Native analyte	699 > 99	0.011	
PFTrDA	Native analyte	663.0 > 619.0	0.011	
PFTrDA_2	Native analyte	663.0 > 169.0	0.011	
PFTeDA	Native analyte	713.0 > 669.0	0.011	
PFTeDA_2	Native analyte	713.0 > 169.0	0.011	
13C2 PFTeDA	IDA	715.0 > 670.0	0.011	
PFHxDA	Native analyte	813 > 769	0.011	
PFHxDA_2	Native analyte	813 > 169	0.011	
13C2 PFHxDA	IDA	815 > 770	0.011	
PFODA	Native analyte	913 > 869	0.011	
PFODA_2	Native analyte	913 > 169	0.011	

Recommended Instrument Operating Conditions				
Retention Times & Quantitation [redacted]				
Native Compounds	**Typical Native RT (minutes)**	**IS analog**	**Typical IDA RT (minutes)**	**Quantitation Method**
PFBA	[redacted]	13C4 PFBA	[redacted]	Isotope Dilution
PFPeA	[redacted]	13C5 PFPeA	[redacted]	Isotope Dilution
PFBS	[redacted]	13C3 PFBS	[redacted]	Isotope Dilution
4:2FTS	[redacted]	M2-4:2FTS	[redacted]	Internal Standard
PFHxA	[redacted]	13C2 PFHxA	[redacted]	Isotope Dilution
PFPeS	[redacted]	13C3 PFBS	[redacted]	Internal Standard
HFPO-DA	[redacted]	13C3 HFPO-DA	[redacted]	Isotope Dilution
PFHpA	[redacted]	13C4 PFHpA	[redacted]	Isotope Dilution
PFHxS	[redacted]	18O2 PFHxS	[redacted]	Isotope Dilution
DONA	[redacted]	13C4 PFOS	[redacted]	Internal Standard
6:2FTS	[redacted]	M2-6:2FTS	[redacted]	Isotope Dilution
PFOA	[redacted]	13C4 PFOA	[redacted]	Isotope Dilution
PFHpS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
PFNA	[redacted]	13C5 PFNA	[redacted]	Isotope Dilution
PFOS	[redacted]	13C4 PFOS	[redacted]	Isotope Dilution
9Cl-PF3ONS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
8:2FTS	[redacted]	M2-8:2FTS	[redacted]	Isotope Dilution
PFDA	[redacted]	13C2 PFDA	[redacted]	Isotope Dilution
PFNS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
MeFOSAA	[redacted]	d3-MeFOSAA	[redacted]	Isotope Dilution
11Cl-PF3OUdS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
EtFOSAA	[redacted]	d5-EtFOSAA	[redacted]	Isotope Dilution
PFDS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
PFUdA	[redacted]	13C2 PFUdA	[redacted]	Isotope Dilution
FOSA	[redacted]	13C8 FOSA	[redacted]	Isotope Dilution
PFDoA	[redacted]	13C2 PFDoA	[redacted]	Isotope Dilution
10:2FTS	[redacted]	M2-8:2FTS	[redacted]	Internal Standard
PFDoS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
PFTrDA	[redacted]	13C2 PFTeDA	[redacted]	Internal Standard
PFTeDA	[redacted]	13C2 PFTeDA	[redacted]	Isotope Dilution
PFHxDA	[redacted]	13C2 PFHxDA	[redacted]	Isotope Dilution
PFODA	[redacted]	13C2 PFHxDA	[redacted]	Internal Standard

Note: clients must be notified when the quantitation of an analyte is performed using an Internal standard. Changes to these IDA/ISTD associations may be necessary when sources of IDAs are updated: this may include additions as new IDAs become available, or subtractions if IDAs are unavailable.

10.4 Instrument Tuning

Instrument tuning is done initially when the method is first developed and thereafter as needed to maintain the sensitivity and selectivity of the method. Tuning is done by infusing each individual compound (native and IDA) into the MS/MS electrospray probe. The responses for the parent and daughter ions for each compound are observed and optimized for sensitivity and resolution. Mass assignments are reviewed and calibrated if necessary. The mass assignments must be within ± 0.5 amu of the values shown in the table above.

10.5 Instrument Calibration

Perform initial calibration with a minimum of five calibration standards before any sample analysis (initial method set-up), whenever a new column is installed, when significant instrument maintenance has been performed, and when the CCV does not meet acceptance criteria. Significant instrument maintenance includes installing a new column, changing the proportioning valve, or changing components of the MS/MS system. A new calibration is not required following minor maintenance.

With the exception of the circumstances delineated in policy CA-Q-P-003, it is not acceptable to remove points from a calibration curve. In any event, at least five points must be included in the calibration curve. Average Response Factor and linear fit calibrations require five points, whereas Quadratic (second order) calibrations require six points. The same injection volume must be used for all injections (standards and extracts).

Calibration is by average response factor, linear fit, or by quadratic fit. Quadratic fit is used for the analyte if the response is non-linear; it's use requires a minimum of 6 calibration standards.

For average response factor (RFa), the relative standard deviation (RSD) for all compounds quantitated by isotope dilution must be < 20% for the curve to be valid.

For average response factor (RFa), the relative standard deviation (RSD) for all compounds quantitated by internal standard (i.e. those compounds that do not have corresponding isotopically labeled analogs) must be < 25% for the curve to be valid.

For linear fit, the intercept of the line must be less than ½ the reporting limit, and the coefficient of determination (r2) must be greater than or equal to 0.990 for the curve to be considered valid (or the correlation coefficient (r) > 0.995).

Evaluation of Calibration Curves

The following requirements must be met for any calibration to be used:

-Response must increase with increasing concentration.

-The absolute value of the intercept of a regression line (linear or non-linear) at zero response must be less than the reporting limit.

-There should be no carryover at or above 1/2 MRL after a high CAL standard.

-The low cal. point must recover to within 50-150%, and all others must recover to within 70-130%.

If these criteria are not met, instrument conditions and standards will be checked, and the ICAL successfully repeated before continuing.

Weighting of Calibration Points

In linear and quadratic calibration fits, the points at the lower end of the calibration curve have less absolute variance than points at the high concentration end of the curve. This can cause severe errors in quantitation at the low end of the calibration. Because accuracy at the low end of the curve is very important for this analysis, it is preferable to increase the weighting of the lower concentration points. 1/concentration or 1/x weighting is encouraged. Visual inspection of the line fitted to the data is important in selecting the best fit.

10.6 Initial Calibration

Prepare the working calibration standards using the recommended formulations given in Appendix B ensuring the lowest calibration standard for each analyte is equal to or below the established RL. Unless otherwise specified on a project basis, use calibration levels 1 to 6 to establish the calibration curve for each analyte.

Prime the instrument by analyzing a minimum of 4 "primer" solutions consisting of 80/20 methanol/water. In general, an HPLC contains components made from PTFE, which enable the pumps to work with many types of organic solvents. Despite efforts to remove as much PTFE as possible, certain components cannot be replaced and contribute PFAS. The longer the system remains idle, the more PFAS that is yielded. Therefore these primers serve to reduce and stabilize the amount of PFAS that are contributed. Immediately following the primers is a Blank, the ICAL sequence (run in ascending order of Level 1 to Level 6), the ICB, the ICV and the first analytical window of extracts (up to 10 field samples). The data is acquired using Sciex's Analyst 1.6.

The Chrom Review data system generates calibration data by generating relative response factors (RRFs) based on the response of the target analyte and its corresponding Isotope Dilution Analyte (or Internal Standard) as well as their injection concentrations to ultimately generate Mean Response Factors. All analytes calibrated using IDA must have RSD values < 20%, all analytes calibrated using ISTD must have RSD values < 25%. The IDA compounds are also calibrated using an external RF model using response and concentration. The IDA RSD must be < 50%. Alternatively, a linear regression curve of concentration vs. peak area for each analyte relative to their corresponding IDA/ISTD and their concentrations calculates the correlation coefficient with 1/concentration weighting. The calibration must have a correlation coefficient (r) $\geq$ 0.995 ($r^2 \geq 0.990$). If criteria are not met, correct the problem and repeat calibration. Further analysis may not proceed without valid calibration.

10.7 Initial Calibration Blank (ICB)

Immediately following the ICAL, a calibration blank is analyzed that consists of an injection of [redacted] fortified with IDA solution at 50 ng/mL

The result for the calibration blank must be less than the reporting limit.

If the ICB is greater than the reporting limit then the source of contamination must be identified and any necessary cleaning completed, and then the instrument should be recalibrated.

10.8 Second Source Calibration Verification (ICV)

Following the ICAL and the ICB, an ICV standard obtained from a different source or vendor than the ICAL standards is analyzed. This ICV standard is a mid-range standard.

The recovery for the ICV must meet the appropriate following criteria:

The native analyte must be within or equal to 70-130% for all native analytes quantitated by isotope dilution.

The native analyte must be within or equal to 70-130% for all native analytes quantitated by internal standard (i.e. those compounds that do not have corresponding isotopically labeled analogs).

The IDA recovery must be within or equal to 50-150%.

See Table 3 for corrective actions in the event that the ICV does not meet the criteria above.

10.9 Continuing Calibration Verification (CCV)

Analyze a CCV at the beginning of a run, the end of a run, and after every 10 samples to determine if the calibration is still valid. The exception is after an acceptable curve and ICV are run 10 samples can be analyzed before a CCV is required. The CCVs are usually at the mid-level range of the curve and should vary throughout the run. The curve and ICV do not need to be run every day. To start an analytical run a CCV can be analyzed and if it meets acceptance criteria a run can be started. In addition, the low standard in the curve must be analyzed and must be within ± 50% of the expected value.

The recovery for the CCV standards must be equal to or within 70-130% (50-150% for low level standards) for all natives quantitated by isotope dilution and for all natives quantitated by internal standard. The recovery for the IDA must be within or equal to 70-130% of the true value.

If this is not achieved, the instrument has drifted outside the calibration limits. If the CCV fails again following minor maintenance, the instrument must be recalibrated.

10.10 Isotope Dilution Analytes (IDA)

The IDA solution is added to each field and QC sample at the time of extraction, as described in Section 10.1. As described in Section 7, this solution consists of isotopically labeled analogs of the analytes of interest.

IDA recoveries are flagged if they are outside of the acceptance limits. Quantitation by isotope dilution generally precludes any adverse effect on data quality due to IDA recoveries being outside of the acceptance limits as long as the signal-to-noise ratio is greater than 10:1.

> Evaluate data quality for usability, flag and submit a non-conformance memo for any analytes outside of the recovery criteria, and report if data is deemed not adversely effected.
>
> Re-extraction of samples should be performed if the signal-to-noise for any IDA is less than 10:1 or if the IDA recoveries fall below 10%.
>
> Re-extraction may be necessary under other circumstances when data quality has been determined to be adversely affected.

10.11 Troubleshooting:

Check the following items in case of calibration failures:

Evaluate the failure to determine whether it affects all of the compounds in the ICAL equally. If one ICAL point appears low or high, reprep the curve and rerun, as the error was most likely prep-based. If only a subset of the analytes are affected, check the integration and chromatography to see if there are anomalies; if justifiable, correct the integration so it is consistent with the other ICAL levels.

If there are no peaks for all compounds or no peaks after a specific retention time, ensure that the HPLC pump is pumping properly; it may have shut down due to overpressure or has a leak. If the

pump has shut down, confirm it is primed and replace the in-line filter. If the pressure climbs above expected levels, changing the guard column and even analytical column may be necessary. It's best to chase high pressure sources from the pump forward (ie the post-pump in-line filter, isolator column, post-autosampler in-line filter, guard column, analytical column and MSMS inlet. If the pump is still pumping, check the system pressure. If it is lower than expected, check for leaks. Start with all connections, then move on to pump seals, especially if there are wide variations in pressure when pumping the same solvents at the same flow rates. If the pump is still pumping and the pressure is normal, check to make sure the MSMS is still functioning properly. Most issues with the MSMS system will be noted by the instrument software.

If there are peaks for all analytes, evaluate the peak shapes by comparing them to the ICAL chromatography. If the peaks have changed (shorter and wider), a new guard column may improve peak shape and bring the system back into compliance. If a new column is necessary, a new ICAL will be needed.

Preventive and routine maintenance is described in the table below

HPLC/MS/MS Preventative Maintenance
As Needed: Change pump seals. Change in-line filters in autosampler (HPLC). Check/replace in-line frit if excessive pressure or poor performance. Replace column if no change following in-line frit change. Replace fused silica tube in ESI interface. Clean lenses. Clean skimmer. Ballast rough pump 30 minutes.
Daily (When in use) Check solvent reservoirs for sufficient level of solvent. Verify that pump is primed, operating pulse free. Check needle wash reservoir for sufficient solvent. Verify capillary heater temperature functioning. Verify vaporizer heater temperature. Verify rough pump oil levels. Verify turbo-pump functioning. Verify nitrogen pressure for auxiliary and sheath gasses. Verify that multiplier is functioning.

10.12 Sample Analysis

Place the field and QC samples in a sequence that begins with the calibration standards followed by the analysis of QC samples, field samples and continuing calibration verification standards (CCVs).

An example analytical sequence that includes initial calibration (ICAL) is provided below.

Injection Number	Lab Description
1	Primer 1
2	Primer 2
3	Primer 3

Injection Number	Lab Description
4	Primer 4
5	Blank
6	Calibration Level 1
7	Calibration Level 2
8	Calibration Level 3
9	Calibration Level 4 (ICIS)
10	Calibration Level 5
11	Calibration Level 6
12	ICB
13	ICV
14	T-PFOA
15	MB
16	LCS
17-26	(up to) 10 Field samples
27	CCV L4
28-37	(up to) 10 Field samples
38	MS
39	MSD
40	CCV L5
41	MB
42	LCS
43-52	(up to) 10 Field samples
53	CCV L4
54-63	(up to) 10 Field samples
65	MS
66	MSD
67	CCV L5

An example analytical sequence without ICAL:

Injection Number	Lab Description
1	Primer 1
2	Primer 2
3	Primer 3
4	Primer 4
5	CCB
6	CCVL (LOQV)
7	CCVIS (L4)
8	MB
9	LCS
10-19	(up to) 10 Field samples
20	CCV L5
21-30	(up to) 10 Field samples
31	MS
32	MSD
33	CCV L4
34	MB
35	LCS

36-45	(up to) 10 Field samples
46	CCV L5
47-56	(up to) 10 Field samples
57	MS
58	MSD
59	CCV L4

Enter the sample ID's into the data acquisition program in the order the samples were placed in the autosampler and initiate the analytical sequence.

11.0 Corrective Action

When an out-of-control situation occurs that is not delineated in this corrective action table or the corrective actions listed do not adequately address the circumstances, a Corrective Action Report (CAR) (NCM), etc., must be developed (see SOP BR-QA-016) and the analyst must use his/her best analytical judgment and available resources to determine the corrective action to be taken. The out-of-control situation may be caused by more than one variable. The analyst should seek the assistance of his/her immediate supervisor, QA manager or other experienced staff if they are uncertain of the cause of the out-of-control situation. The analysis must not be resumed until the source of the problem and an in-control status is re-established. All samples associated with the out-of-control situation must be reanalyzed after in-control status has been re-established or if authorization is received from the supervisor or QA Manager for release with data qualification.

12.0 Calculations / Data Reduction

12.1 Qualitative Identification

The data processing system identifies the target analytes by comparing the retention time of the peaks to the retention times of the initial calibration standards. The retention times of PFAS with labeled standards must be the same as that of the labeled IDA's to within 0.05 min. For PFAS with no labeled standards, the RT must be within ± 0.3 minutes of the CCVIS standards. *Note: The IS RT and native RT may be offset by 0.02 to 0.04 minutes.*

12.2 Quantitative Identification

The ICAL established in Section 10.10 is used to calculate concentrations for the extracts. The data processing system determines on-column concentration. Final results are calculated by the laboratory's LIMS information system (TALS).

Dilute and reanalyze samples whose results exceed the calibration range. The diluted analysis should result in a determination within the upper half of the calibration curve.

Check the results of samples analyzed immediately after high concentration samples (those with results above calibration range) for signs of carry-over. Reanalyze all samples suspected of carry -over.

12.3 Calculations

See Appendix C.

12.4 Data Review

Refer to laboratory SOP BR-QA-019 for additional instruction on the requirements for data review. The following sections summarize the general procedure as described in the data review SOP.

12.5 Primary Review

Review the chromatography and quantitation in the data processing system to confirm quantitative and qualitative identification of each target analyte. Perform and document manual integrations only if needed per the instructions in corporate policy CA-Q-S-002, Acceptable Manual Integration Practices.

Upload the data files to TALS and process the batch. Enter job information into the batch editor and add the standards and reagent additions to the worksheet, if necessary. Review the results against acceptance criteria. If acceptance criteria are not met, perform corrective action or make arrangements for corrective action with another analyst.

Set results to primary, secondary, acceptable or rejected. Set results to be reported to a status of primary and secondary. Set results that meet criteria but will not be reported to acceptable. Set results that do not meet criteria to rejected, to prevent inadvertent reporting of data.

Verify that all appropriate QC were performed and acceptable. If insufficient volume is received (MS, MSD, FRB, etc…) document in an NCM. Record all instances where acceptance criteria are not met in a nonconformance memo (NCM).

Verify that all project requirements or program specific requirements were followed. If not, immediately notify the project manager to determine an appropriate course of action. Record decisions made in the data review checklist.

Set the batch to 1st level review. Complete the data review checklist and make arrangements for secondary review by a peer analyst.

12.6 Secondary Data Review (Performed by Peer Analyst)

Record review using the data review checklist.

Verify that all project requirements or program specific requirements were followed. If not, consult with the primary analyst to determine cause. Any decisions made should be recorded on the data review checklist and retained as part of the analytical record.

Review the TALS batch editor to verify ancillary information for the work performed is filled in.

Verify that that the procedures in this SOP were followed. If discrepancy between the SOP and the analytical record is found, consult with the primary analyst to determine the source of the discrepancy. Resolve the discrepancy and verify any modifications to the SOP are properly

documented and were approved by laboratory management. Record all SOP deviations in an NCM.

Spot-check ~15% of samples in the batch to verify quantitative and qualitative identification.

If manual integrations were performed:

- Review each manual integration to verify that the integration is consistent and compliant with the requirements specified in SOP CA-Q-S-002.

- Check to ensure an appropriate technical reason code is provided for each manual integration. Acceptable technical reason codes are provided in SOP CA-Q-S-002.

- If an error is suspected, the reviewer must consult with the analyst that performed the integration to determine if a correction is necessary. Input from the Technical Manager (TM), Department Manager (DM), or QA Manager (QAM) may be sought as necessary. **The reviewer may not reintegrate except in those circumstances approved by laboratory management**, such as when the analyst that performed the integration is on vacation. If re-integration is performed by the reviewer, the reviewer is now considered the "primary analyst" and the re-integration is subject to the same review and documentation requirements as the original integration.

Verify acceptance criteria were met. If not, verify that corrective actions were performed and the nonconformance was documented with an NCM. Review the NCM to verify the form is filled out and the requisite information has been included in the internal comments tab. If corrective action was not performed and the failure not documented, consult with the primary analyst to determine cause. Consult with the primary analyst and department management to determine what actions should be taken, then follow-through with the decision made.

Run the QC checker and fix any problems found. Run and review the deliverable for gross error such as missing data. Fix any problems found.

When review is complete set the method chain to lab complete. Complete the data review checklist and forward associated paperwork to report/project management.

12.7 Data Reporting & Record Retention

The specifications for data reporting are set by the project manager and are performed by TALS using the formatter selected by the PM. The type of deliverable is also set by the PM based on various deliverable options in the TALS system. The formatters and deliverables are programmed into TALS by corporate IT staff and cannot be modified locally.

The following sections describe the default reporting scheme set for this method in TALS:

Data is retained, managed and archived as specified in laboratory SOP BR-QA-014 Laboratory Records.

13.0 Method Performance

13.1 Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. An initial method detection limit study is performed in accordance with SOP BR-QA-005. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method or program requirements require a greater frequency.

13.2 Demonstration of Capabilities

All personnel are required to perform an initial demonstration of proficiency (IDOC) on the instrument they will be using for analysis prior to testing samples. On-going proficiency must be demonstrated annually. IDOCs and on-going proficiency demonstrations are conducted as follows.

13.2.1 Four aliquots of the QC check sample are analyzed using the same procedures used to analyze samples, including sample preparation. The concentration of the QC check sample may be equivalent to a mid- level calibration.

13.2.2 Calculate the average recovery and standard deviation of the recovery for each analyte of interest.

13.2.3 If any analyte does not meet the acceptance criteria, the test must be repeated. Only those analytes that did not meet criteria in the first test need to be evaluated. TNI 2016 requires consecutive passing results. Repeated failure for any analyte indicates the need for the laboratory to evaluate the analytical procedure and take corrective action.

13.2.4 Until the IDOC is approved by the QA Manager (or designee); the trainer and trainee must be identified in the batch record.

13.3 Training Requirements

The Group Leader is responsible for ensuring that this procedure is performed by an associate who has been properly trained in its use and has the required experience. A new analyst must be working under documented supervision prior to approval of the IDOC. Documentation that a new analyst is performing under supervision must be entered into the batch record (View Batch Information) until that analyst's IDOC has been approved by the QA Manager (or designee). See requirements for demonstration of analyst proficiency in SOP BR-QA-011.

14.0 Pollution Control

Employees must abide by the policies and procedures in the NDSC Eurofins TestAmerica Laboratories Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

15.0 Waste Management

Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to BR-EH-001. The following waste streams are produced when this method is carried out.

- Vials containing sample extracts: Satellite Container: 30 gallon poly barrel located under GC-Semi prep hood.
- Solvent Waste: Satellite Container: 5 gallon poly carboy located under LCMSMS.

16.0 References / Cross References

- Cheryl Moody, Wai Chi Kwan, Johnathan W. Martin, Derek C. G. Muir, Scott A. Mabury, "Determination of Perfluorinated Surfactants in Surface Water Samples by Two Independent Analytical Techniques: Liquid Chromatography/Tandem Mass Spectrometry and 19FNMR," Analytical Chemistry 2001, 73, 2200-2206.
- John Giesy et al., "Accumulation of Perfluorooctane Sulfonate in Marine Mammals", Environmental Science & Technology, 2001 Vol. 35, No. 8, pages 1593-1598.
- U.S. EPA, "Residue Chemistry Test Guidelines, OPPTS 860.1340, Residue Analytical Method", EPA 712-C-95-174, August 1995.
- STL Denver White Paper DEN-W-LC-002, "Method Validation Study for Analysis of Ammonium Perfluorooctanoate in Soil Matrices by High Performance Liquid Chromatography/Mass Spectrometry (HPLC/MS/MS)", Mark Dymerski, September 5, 2003.
- STL Denver White Paper DEN-W-LC-003, "Addendum A to Method Validation Study for Analysis of Ammonium Perfluorooctanoate in Soil Matrices by High Performance Liquid Chromatography/Mass Spectrometry (HPLC/MS/MS)", Mark Dymerski, August 6, 2003.
- STL Denver White Paper DEN-W-LC-004, "Method Validation Study for Analysis of Perfluorooctanoic Acid in Waters by High Performance Liquid Chromatography/Tandem Mass Spectrometry (HPLC/MS/MS)", Mark Dymerski, January 26, 2005.
- Waters application note; "Acquity UPLC System for Quantifying Trace Levels of Perfluorinated Compounds with an Acquity PFC Analysis Kit", Peter J. Lee, Evan T. Bernier, Gordon T. Fujimoto, Jeremy Shia, Michael S. Young, and Alice J. Di Gloia, Waters Corporation, Milford, MA. USA.
- Method ISO 25101, "Water quality – Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) – Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry", First Edition, 2009-03-01, International Organization for Standardization, Technical Committee ISO/TC 147, Water Quality, Subcommittee SC 2, Physical, chemical and biochemical methods.
- US EPA, "Method 537 - Determination of Selected Perfluorinated alkyl acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometery (LC/MS/MS)", Version 1.1, September 2009, J.A. Shoemaker, P.E. Grimmett, B.K. Boutin, EPA Document #: EPA/600/R-08/092.
- Laboratory SOP BR-QA-005 *Procedures for the Determination of Limits of Detection (LOD), Limits of Quantitation (LOQ) and Reporting Limits (RL).*
- Laboratory SOP BR-QA-011 *Employee Training*
- Laboratory SOP BR-EH-001 *Hazardous Waste*
- Laboratory SOP BR-QA-014 *Laboratory Records*

- Laboratory SOP BR-QA-006 *Procedures & Documentation Requirements for Manual Integration*
- Laboratory Quality Assurance Manual (QAM)
- Corporate TestAmerica SOP CA-Q-S-002 *Manual Integrations*.

17.0 Method Modifications

Modification Number	Method Reference	Modification & Technical Justification
1	Section 7.2	Method 25101 specifies that the values reported for PFOA and PFOS shall be the linear isomer only. In keeping with the dictates of USEPA 537 and other US conventions, the laboratory reports both the branched (when present) and linear isomers as a single value for these compounds.
2	Section 10.1	A different SPE cartridge, Waters OASIS WAX, is used for the extraction process. As a result, solvents and elution procedures are different.
3	Section 10.1	The samples are fortified with a greater number of labeled analytes (most analytes have labeled versions) prior to extraction.
4	Section 10.5	The HPLC Column, Eluents and gradient conditions have changed.
5	Section 10.5	For non-drinking water matrices, the analyte list has expanded. The number of labeled analytes has also expanded to improve quantitation.
6	Table 1	The reporting limits have changed to a consistent value.
7	Appendix B	Calibration levels have been changed so all levels have the same analyte concentration.

18.0 Attachments

- Table 1: Routine Compound List and LOQ
- Table 2: Primary Materials Used
- Table 3: QC Summary & Recommended Corrective Action
- Table 4: Control Limits
- Appendix A: Terms and Definitions
- Appendix B: Standard Preparation Tables
- Appendix C: Equations

19.0 Revision History (all revision history must be retained in this SOP)

Revision 6.1: Date effective 09/28/2020

- Updated cover page dates and signatories
- Section 1.1: Updated reporting limit ranges to reflect current practice. Added clarification for non-potable samples are only analyzed in NJ.

- Section 7.3: Updated standard preparation solutions for IDA solution from 1000 ng/mL to 500 ng/mL and Internal standard solution from 2500 ng/mL to 1250 ng/mL to reflect current practice.
- Section 8.0: Added 28 day holding time specific to samples collected in NJ.
- Section 10.1: Changed IDA solution to have a fixed concentration of 1.25 ng/mL
- Sections 10.1.5 and 10.2.5.: Updated Internal standard used from 2500 ng/mL to 1250 ng/mL to reflect current practice.
- Sections 5.0 and 11.0: Update to standard language as required by corporate NDSC.
- Section 19.0: Added effective dates.
- Table 1: Updated reporting limits to reflect current practice.
- Table 3: Added NJ specific requirement.
- Appendix B: Updated information to for IDA and Internal Standard formulations to reflect current practice.

Revision 6.0: Date effective 04/24/2020

- Updated cover page dates, copyright information, and signatories
- Throughout: Added support for soil, sediment and tissue matrices.
- Throughout: Removed reference to analysis using Waters instrumentation.
- Throughout: Removed reference to final extract concentration for aqueous samples.
- Section 1.1: Update Fluorotelomer sulfonates (FTS) to report acid forms
- Section 11.0: Added corrective action requirement as it is a corporate requirement to include.

Revision 5.0: Date effective 10/11/2019

- Updated cover page dates, copyright information, and signatories
- Throughout: removed references to drinking water. Will add back if adopted.
- Throughout: removed solid extraction/analysis verbiage missed in previous revision.
- Throughout: revised formatting to be consistent
- Throughout: added PFHxDA, PFODA, PFDoS, 10:2FTS, HFPO_DA, DONA, F53BMajor, and F53B Minor as additional analytes and IDAs
- Section 4.0: added interference information about $^{13}C_2$-PFHxDA
- Section 6.1: updated to include additional laboratory apparatus information
- Section 6.2: updated to include additional instrument and more detail for existing instrument
- Section 7.1: added more detail to reagent information and the addition of Ammonium acetate and Ammonium hydroxide
- Section 7.2: added PFHpS and PFDS as other PFAS not available in the acid form. Added the IDA and ISTD are added at a fixed concentration and removed the low level reference
- Section 9.1 added a NCM must be added for MS/MSD
- Section 10.1: removed the low level spike reference and added the PFAS-IDA solution is added to each sample and QC sample in concentrated extract and non-concentrated extracts
- Section 10.2: In the previous version of this SOP, the “Note” was removed and replaced with “Warning: The use of a vacuum system creates the risk of glassware implosion. Inspect All glassware prior to use. Glassware with chips, scratches, rub marks or cracks must not be used.”
- Section 10.2: changed wording to clarify addition of poly siphon line into the SPE cartridge

- Section 10.3: removed to keep test tube as keep and added “Note: If the extracts will note be concentrated, [redacted] for the second bottle rinse so the final volume is approximately 8mL.”
- Section 10.5: added sample cleanup with graphitized carbon section
- Section 10.6: added wording to have [redacted] of reagent water to the 10mL extract at this time
- Section 10.7: updated wording
- Section 10.8: added operating system for new instrument and added more detail for existing instrument
- Section 10.17: updated sample analysis to include calibration currently in use
- Table 1 and Table 4: updated to include additional analytes and IDAs
- Appendix A: updated terms and definitions from body of SOP
- Appendix B: updated to include additional analytes and IDAs

Revision 4.0: Date effective 04/12/2019

- Updated cover page dates, copyright information, and signatories
- Headers: removed TestAmerica logo and added Eurofins logo
- Throughout: removed references to drinking water. Will add back if adopted.
- Throughout: revised formatting to be consistent
- Section 1.1: added note about addition of Appendix D, removed NJDEP as PAB
- Section 10.1.3: added note about the use of glass pipettes
- Section 10.3: In a previous version of this SOP, Table “Recommended Instrument Operating Conditions” incorrectly referenced PFTrDA as Isotope Dilution, so this was corrected to Internal Standard and added note to contact clients for ISTD quantitation.
- Removed verbiage regarding soil LOQ from Note on Table 1.
- Added Appendix D: NJDEP secondary certified analytes list

Revision 3.0: Date effect 12/12/2018

- Updated cover page dates and signatories
- Section 10.1: added note for handling incomplete volume extraction process
- Section 18: added previous revision history back into SOP
- Throughout: updated QC criteria from EPA 537 r1.1 that was missed in previous revision
- Throughout: removed solid extraction/analysis verbiage missed in previous revision.
- Throughout: updated calibration to include criteria from EPA 537 r1.1 and to include the 9 calibration points currently in use.
- Throughout: minor formatting updates

Rev 2.1: Date effective 10/11/2018

- Updated cover page dates and signatories
- Section 8: added preservation requirements for DW samples.
- Throughout: updated QC criteria to match EPA537 rev1.1
- Throughout: removed references to solid and tissue extraction/analysis.

Rev 2.0: Date effective 07/31/2018

- Updated cover page and signatories
- Section 8: added preservation requirements for DW samples.
- Throughout: included verbiage that Non-drinking water matrices are not certified under PAB.
- Throughout: separated DW and non-DW limits and QC requirements.

- Throughout: minor formatting and typographical corrections.
- Tables 3 & 4: updated limit to meet EPA 537 criteria.
- Appendix A: updated terms and definitions from body of SOP

Rev 1.0: Date effective 01/19/2018

- Extended analyte list to 21 native compounds and 18 IDAs.
- Altered concentration step in extract preparation by employing a reagent water keeper instead of concentrating to dryness.
- Incorporated use of internal standard for IDA recovery calculation.

Revision 0.0: Date effective 05/19/2017

- New SOP based on USEPA method 537

Previous revisions are retained by the QA department.

Table 1: Routine Compound List & Limit of Quantitation (LOQ)

Compound Name	Abbreviation	CAS #	Water (ng/L)	Soil/ Sediment (ug/Kg)	Tissue (ug/Kg)
Perfluoroalkylcarboxylic acids (PFCAs)					
Perfluoro-n-butanoic acid	PFBA	375-22-4	5.0	0.50	1.0
Perfluoro-n-pentanoic acid	PFPeA	2706-90-3	2.0	0.20	1.0
Perfluoro-n-hexanoic acid	PFHxA	307-24-4	2.0	0.20	1.0
Perfluoro-n-heptanoic acid	PFHpA	375-85-9	2.0	0.20	1.0
Perfluoro-n-octanoic acid	PFOA	335-67-1	2.0	0.20	1.0
Perfluoro-n-nonanoic acid	PFNA	375-95-1	2.0	0.20	1.0
Perfluoro-n-decanoic acid	PFDA	335-76-2	2.0	0.20	1.0
Perfluoro-n-undecanoic acid	PFUdA	2058-94-8	2.0	0.20	1.0
Perfluoro-n-dodecanoic acid	PFDoA	307-55-1	2.0	0.20	1.0
Perfluoro-n-tridecanoic acid	PFTrDA	72629-94-8	2.0	0.20	1.0
Perfluoro-n-tetradecanoic acid	PFTeDA	376-06-7	2.0	0.20	1.0
Perfluoro-n-hexadecanoic acid	PFHxDA	67905-19-5	2.0	0.20	1.0
Perfluoro-n-octadecanoic acid	PFODA	16517-11-6	2.0	0.20	1.0
Perfluorinated sulfonic acids (PFSAs)					
Perfluoro-1-butanesulfonic acid	PFBS	375-73-5	2.0	0.20	1.0
Perfluoro-1-pentanesulfonic acid	PFPeS	2706-91-4	2.0	0.20	1.0
Perfluoro-1-hexanesulfonic acid	PFHxS	355-46-4	2.0	0.20	1.0
Perfluoro-1-heptanesulfonic acid	PFHpS	375-92-8	2.0	0.20	1.0
Perfluoro-1-octanesulfonic acid	PFOS	1763-23-1	2.0	0.20	1.0
Perfluoro-1-nonanesulfonic acid	PFNS	68259-12-1	2.0	0.20	1.0
Perfluoro-1-decanesulfonic acid	PFDS	335-77-3	2.0	0.20	1.0
Perfluoro-1-dodecanesulfonic acid	PFDoS	79780-39-5	2.0	0.20	1.0
Perfluorinated sulfonamides (FOSA)					
Perfluoro-1-octanesulfonamide	FOSA	754-91-6	2.0	0.20	1.0
Perfluorinated sulfonamidoacetic acids (FOSAA)					
N-ethylperfluoro-1-octanesulfonamidoacetic acid	EtFOSAA	2991-50-6	5.0	2.0	10.0
N-methylperfluoro-1-octanesulfonamidoacetic acid	MeFOSAA	2355-31-9	5.0	2.0	10.0
Fluorotelomer sulfonates (FTS)					
1H,1H,2H,2H-perfluorohexane sulfonate *(4:2)*	4:2 FTS	757124-72-4	2.0	2.0	10.0
1H,1H,2H,2H-perfluorooctane sulfonate *(6:2)*	6:2 FTS	27619-97-2	5.0	2.0	10.0
1H,1H,2H,2H-perfluorodecane sulfonate *(8:2)*	8:2 FTS	39108-34-4	2.0	2.0	10.0
1H,1H,2H,2H-perfluorododecane sulfonate*(10:2)*	10:2 FTS	120226-60-0	2.0	2.0	10.0
Fluorinated Replacement Chemicals					
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6	4.0	0.40	2.0
4,8-dioxa-3H-perfluorononanoic acid	DONA	919005-14-4	2.0	0.20	1.0
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	F53B Major (9Cl-PF3ONS)	756426-58-1	2.0	0.20	1.0
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	F53B Minor (11Cl-PF3OUdS)	763051-58-1	2.0	0.20	1.0

NOTE: The LOQ values may vary. The Water LOQ is based on a 250mL nominal sample volume.

Table 2: Primary Materials Used

Material[1]	Hazards	Exposure Limit[2]	Signs and Symptoms of Exposure
Acetic Acid (3-2-1)	Corrosive Poison Flammable	10 ppm-TWA 15 ppm-STEL	Contact with concentrated solution may cause serious damage to the skin and eyes. Inhalation of concentrated vapors may cause serious damage to the lining of the nose, throat, and lungs. Breathing difficulties may occur.
Ammonium Hydroxide (3-0-0)	Corrosive Poison	50 ppm-TWA	Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage to the upper respiratory tract. Symptoms may include sneezing, sore throat or runny nose. Contact with skin can cause irritation or severe burns and scarring with greater exposures. Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent damage, including blindness. Brief exposure to 5000 PPM can be fatal.
Hexane (2-3-0)	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
Hydrochloric Acid (3-0-1)	Corrosive Poison	5 ppm (Ceiling)	Can cause pain and severe burns upon inhalation, ingestion, eye or skin contact. Exposure to concentrated solutions may cause deep ulcerations to skin, permanent eye damage, circulatory failure and swallowing may be fatal.
Methanol (2-3-0)	Flammable Poison Irritant	200 ppm (TWA)	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Potassium Hydroxide (3-0-1)	Corrosive Poison		Severe irritant. Can cause severe burns upon inhalation, ingestion, eye or skin contact. Exposure to concentrated solutions may cause severe scarring of tissue, blindness, and may be fatal if swallowed.
Potassium Persulfate (2-0-1-OX)	Oxidizer	None	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Causes irritation to skin and eyes. Symptoms include redness, itching, and pain. May cause dermatitis, burns, and moderate skin necrosis.

[1] Always add acid to water to prevent violent reactions.
[2] Exposure limit refers to the OSHA regulatory exposure limit.

Table 3: QC Summary, Acceptance Criteria and Recommended Corrective Action (EPA537)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
6-Point Calibration (5 point minimum for CF and Linear Regression) (ICAL)	Before sample analysis, when CCVs indicate calibration is no longer valid; after major instrument maintenance	CF = RSD $\leq$ 20% (compounds calibrated via IDA) CF = RSD $\leq$ 25% (compounds calibrated using "near-IDA" compounds) CF = RSD $\leq$ 50% (IDA standards using ISTD) Each cal pt. = +/-30%Rec. (+/-50%Rec for cal low pt.) Linear Regression: $r^2 \geq 0.990$	Correct problem and repeat initial calibration.
IDA Response	Every injection contains the IDA analytes	Non-DW matrices (for samples collected in NJ – see below): Standards: 50-150% recovery Field samples: 50-150% recovery (poor responding IDAs: 25-150%) (reportable if >10x S/N ratio and >10% ICAL RF)	Standard failures must be investigated to determine the cause of the failure. Recalibration may be required. Samples with recoveries outside acceptance limits must be evaluated for data usability. Re-extraction may be necessary if data quality has been adversely affected.
IDA Response	Every injection contains the IDA analytes	Non-Potable samples collected in NJ: Standards: 50-150% recovery Field samples: 50-150% recovery (reportable if >10x S/N ratio and >10% ICAL RF)	Standard failures must be investigated to determine the cause of the failure. Recalibration may be required. Samples with recoveries outside acceptance limits must be evaluated for data usability. Re-extraction may be necessary if data quality has been adversely affected.
IS Response	Every injection contains the IS analyte	ICAL Standards: Area of individual points must not deviate by more than 50% of ICAL mean area response Samples following ICAL: 50-150% of ICAL mean response Ongoing CCV: 50-150% of ICAL mean response Post-CCV Samples: Area must be within 50-150% of most recent CCVIS (daily opening CCV)	Standard failures must be investigated to determine the cause of the failure. Recalibration may be required. Sample failures may be matrix related and should be evaluated to determine if the data quality has been adversely affected.
Initial Calibration Blank (ICB)	Immediately following the ICAL	Non-DW: < RL for all target analytes	Determine source of interference/contamination, eliminate it and recalibrate.
Second Source Standard Verification (ICV)	Prior to the analysis of samples. Generally immediately after the ICB.	+/-30 for analytes, IS, and SUR.	Correct problem and verify second source standard. If that fails, repeat calibration.
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence, every ten field samples and at the end of each analytical sequence. Alternate between levels 3, 4 and 5.	+/-30%	Rerun any samples analyzed before and after the failing CCV. Take corrective action; if subsequent CCV analyses fail, recalibrate instrument.
Continuing Calibration Verification-Low (CCVL)	Beginning of each analytical sequence that is not preceded by an ICAL to show LOQ is still valid.	CF = 50-150% (ISTD targets) IDA 50-150%	Stop sample acquisition. Take corrective action; if subsequent CCV analyses fail, recalibrate instrument.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Method Blank	One per extraction batch of 20 or fewer samples	Non-DW: < RL for all target analytes	Reprocess MB and associated samples if any target analyte in the MB is at or above the RL, greater than 1/10 the amount detected in any sample or 1/10 the regulatory limit, whichever is greater. If the target is not greater than the RL in the samples associated with an unacceptable method blank, the data may be reported with appropriate qualifiers. If insufficient sample is available to reprocess, report data with appropriate qualifiers.
Laboratory Control Sample	One per extraction batch of 20 or fewer samples (rotate between Low, Med, High)	%R within control limits. See Table 4	Reprep and reanalyze samples for failed analytes. If reanalysis is not possible due to insufficient sample volume, report data with appropriate data qualifiers.
Matrix Spike / Matrix Spike Duplicate	One set per extraction batch when sufficient sample volume is provided	%R within control limits. See Table 4	Evaluate to determine if there is a matrix effect or analytical error. If analytical error, reanalyze or reprocess as appropriate.
Sample Duplicate	One per extraction batch of 20 or fewer samples	RPD within control limits. See Table 4	Evaluate data to determine source for error. If analytical error is suspected, reanalyze or reprocess as appropriate.
Field Reagent Blank	Per client sample set	Non-DW: < RL for all target analytes	Analysis only required if samples contain target analytes at or above the RL. If analytes are present in the FRB at >1/3 RL, all samples must be recollected and re-analyzed.

Table 4: LCS and MS/MSD Control Limits*

Analyte	Water (Low Level) %R	Water (Med-High Level) %R	RPD
Perfluorobutanoic acid (PFBA)	50-150	70-130	20
Perfluoropentanoic acid (PFPeA)	50-150	70-130	20
Perfluorobutanesulfonic acid (PFBS)	50-150	70-130	20
Perfluorohexanoic acid (PFHxA)	50-150	70-130	20
Perfluoropentanesulfonic acid (PFPeS)	50-150	70-130	20
Perfluoroheptanoic acid (PFHpA)	50-150	70-130	20
Perfluorohexanesulfonic acid (PFHxS)	50-150	70-130	20
Perfluorooctanoic acid (PFOA)	50-150	70-130	20
Perfluoroheptanesulfonic acid (PFHpS)	50-150	70-130	20
Perfluorononanoic acid (PFNA)	50-150	70-130	20
Perfluorooctanesulfonic acid (PFOS)	50-150	70-130	20
Perfluorodecanoic acid (PFDA)	50-150	70-130	20
Perfluorononanesulfonic acid (PFNS)	50-150	70-130	20
Perfluoroundecanoic acid (PFUdA)	50-150	70-130	20
Perfluorodecanesulfonic acid (PFDS)	50-150	70-130	20
Perfluorooctanesulfonamide (FOSA)	50-150	70-130	20
Perfluorododecanoic acid (PFDoA)	50-150	70-130	20
Perfluorododecanesulfonic acid (PFDoS)	50-150	70-130	20
Perfluorotridecanoic acid (PFTrDA)	50-150	70-130	20
Perfluorotetradecanoic acid (PFTeDA)	50-150	70-130	20
Perfluorohexadecanoic acid (PFHxDA)	50-150	70-130	20
Perfluorooctadecanoic acid (PFODA)	50-150	70-130	20
1H,1H,2H,2H Perfluorohexanesulfonate (4:2FTS)	50-150	70-130	20

1H,1H,2H,2H Perfluorooctanesulfonate (6:2FTS)	50-150	70-130	20
1H,1H,2H,2H Perfluorodecanesulfonate (8:2FTS)	50-150	70-130	20
1H,1H,2H,2H Perfluorododecanesulfonate (10:2FTS)	50-150	70-130	20
N-Methyl Perfluorooctane sulfonamidoacetic acid (N-MeFOSAA)	50-150	70-130	20
N-Ethyl Perfluorooctane sulfonamidoacetic acid (N-EtFOSAA)	50-150	70-130	20
Hexafluoropropylene oxide dimer acid	50-150	70-130	20
4,8-dioxa-3H-perfluorononanoic acid	50-150	70-130	20
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	50-150	70-130	20
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	50-150	70-130	20

**The limits in this table are those in effect as of the published date of this SOP. The %R limits are specified by EPA 537r1.1 in sections 9.33, 9.36, and 9.37. The RPD the lab uses is more strict than those referenced in EPA 537 r1.1. If the lab makes changes to any of these limits, the updated limits will be no less strict than those specified in EPA537.*

Appendix A: Terms and Definitions

PFCAs: Perfluorocarboxylic acids
PFSAs: Perfluorinated sulfonic acids
FOSA: Perfluorinated sulfonamide
PFOA: Perfluorooctanoic acid
PFOS: Perfluorooctane sulfonate
PTFE: Polytetrafluoroethylene (e.g., Teflon®)
SPE: Solid phase extraction**.**
PP: Polypropylene
PE: Polyethylene
HDPE: High density polyethylene
AFFF: Aqueous Film Forming Foam
IDA: Isotope dilution analytes
Acceptance Criteria: specified limits placed on characteristics of an item, process or service defined in requirement documents.
Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.
Analyte: The specific chemicals or components for which a sample is analyzed. (EPA Risk Assessment Guide for Superfund, OSHA Glossary).
Batch: environmental samples that are prepared and/or analyzed together with the same process, using the same lot(s) of reagents. A preparation/digestion batch is composed of one to 20 environmental samples of similar matrix, meeting the above criteria. An analytical batch is composed of prepared environmental samples (extracts, digestates and concentrates), which are analyzed together as a group.
Calibration: a set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material and the corresponding values realized by the standards.
Calibration Curve: the graphical relationship between the known values or a series of calibration standards and their instrument response.
Calibration Standard: A substance or reference used to calibrate an instrument.
Continuing Calibration Verification (CCV): a single or multi-parameter calibration standard used to verify the stability of the method over time. Usually from the same source as the calibration curve.
Corrective Action: the action taken to eliminate the cause of an existing nonconformity, defect or other undesirable occurrence in order to prevent recurrence.
Data Qualifier: a letter designation or symbol appended to an analytical result used to convey information to the data user. (Laboratory)
Demonstration of Capability (DOC): procedure to establish the ability to generate acceptable accuracy and precision.
Holding Time: the maximum time that a sample may be held before preparation and/or analysis as promulgated by regulation or as specified in a test method.
Initial Calibration: Analysis of analytical standards for a series of different specified concentrations used to define the quantitative response, linearity and dynamic range of the instrument to target analytes.
Intermediate Standard: a solution made from one or more stock standards at a concentration between the stock and working standard. Intermediate standards may be certified stock standard solutions purchased from a vendor and are also known as secondary standards.

Laboratory Control Sample (LCS): a blank matrix spiked with a known amount of analyte(s) processed simultaneously with and under the same conditions as samples through all steps of the procedure.
Matrix Spike (MS): a field sample to which a known amount of target analyte(s) is added.
Matrix Spike Duplicate (MSD): a second replicate matrix spike
Method Blank (MB): a blank matrix processed simultaneously with and under the same conditions as samples through all steps of the procedure. Also known as the preparation blank (PB).
Method Detection Limit (MDL): the minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific measurement system. The MDL is a statistical estimation at a specified confidence interval of the concentration at which relative uncertainty is ±100%. The MDL represents a range where qualitative detection occurs. Quantitative results are only produced in this range and qualified with the proper data reporting flag when a project requires this type of data reporting.
Non-conformance: an indication, judgment, or state of not having met the requirements of the relevant specification, contract or regulation.
Precision: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves.
Preservation: refrigeration and/or reagents added at the time of sample collection to maintain the chemical, physical, and/or biological integrity of the sample.
Quality Control Sample (QC): a sample used to assess the performance of all or a portion of the measurement system.
Reporting Limit (RL): the level to which data is reported for a specific test method and/or sample.
Stock Standard: a solution made with one or more neat standards usually with a high concentration. Also known as a primary standard. Stock standards may be certified solutions purchased from a vendor.
Surrogate: a substance with properties that mimic the analyte of interest but that are unlikely to be found in environmental samples.

Appendix B: Standard Preparation Tables

The standard formulations contained in this appendix are recommended and are subject to change. If the concentration of the stock standard is different than those noted in this table, adjust the standard preparation formulation accordingly. Unless otherwise specified, prepare the standard solutions in methanol using Class A volumetric glassware and Hamilton syringes and assign an expiration date of 1 year from date of preparation unless the parent standard expires sooner; then use the earlier date. See laboratory SOP BR-QA-002 *Standard Preparation* for further guidance. For stock standards solutions made from neat material, assign an expiration date of 2 years from the date of formulation.

Stock Standard Solutions

PFAS LCS/Matrix Spike Stock Solution 1000 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (µg/mL)	Volume Added (µL)	Final Volume (mL)	Final Conc (ng/mL)
PFBA	Wellington Laboratories Code: PFBA	Perfluorobutanoic acid	50	200	10	1000
PFPeA	Wellington Laboratories Code: PFPeA	Perfluoropentanoic acid	50	200		1000
PFBS	Wellington Laboratories Code: L-PFBS	Perfluorobutanesulfonic acid	44.2	200		884
PFHxA	Wellington Laboratories Code: PFHxA	Perfluorohexanoic acid	50	200		1000
PFPeS	Wellington Laboratories Code: L-PFPeS	Perfluoropentanesulfonic acid	46.9	200		938
PFHpA	Wellington Laboratories Code: PFHpA	Perfluoroheptanoic acid	50	200		1000
PFHxSK	Wellington Laboratories Code: br-PFHxSK	Perfluorohexanesulfonic acid	45.5	200		910
PFOA	Wellington Laboratories Code: PFOA	Perfluorooctanoic acid	50	200		1000
PFHpS	Wellington Laboratories Code: L-PFHpS	Perfluoroheptanesulfonic acid	47.6	200		952
PFNA	Wellington Laboratories Code: PFNA	Perfluorononanoic acid	50	200		1000
PFOS	Wellington Laboratories Code: br-PFOSK	Perfluorooctanesulfonic acid	46.4	200		928
PFDA	Wellington Laboratories Code: PFDA	Perfluorodecanoic acid	50	200		1000
PFNS	Wellington Laboratories Code: L-PFNS	Perfluorononanesulfonic acid	48.0	200		960
PFUdA	Wellington Laboratories Code: PFUdA	Perfluoroundecanoic acid	50	200		1000
PFDS	Wellington Laboratories Code: L-PFDS	Perfluorodecanesulfonic acid	48.2	200		964
FOSA	Wellington Laboratories Code: FOSA-I	Perfluorooctane sulfonamide	50	200		1000
PFDoA	Wellington Laboratories Code: PFDoA	Perfluorododecanoic acid	50	200		1000
PFDoS	Wellington Laboratories Code: L-PFDoS	Perfluorododecanesulfonic acid	48.4	200		968
PFTrDA	Wellington Laboratories Code: PFTrDA	Perfluorotridecanoic acid	50	200		1000
PFTeDA	Wellington Laboratories Code: PFTeDA	Perfluorotetradecanoic acid	50	200		1000
PFHxDA	Wellington Laboratories Code: PFHxDA	Perfluorohexadecanoic acid	50	200		1000
PFODA	Wellington Laboratories Code: PFODA	Perfluorooctadecanoic acid	50	200		1000
4:2FTS	Wellington Laboratories Code: 4:2FTS	1H,1H,2H,2H-perfluorohexane sulfonate (4:2)	46.7	200		934
6:2FTS	Wellington Laboratories Code: 6:2FTS	1H,1H,2H,2H-perfluorooctane sulfonate (6:2)	47.4	200		948

8:2FTS	Wellington Laboratories Code: 8:2FTS	1H,1H,2H,2H-perfluorodecane sulfonate (8:2)	47.9	200		958
10:2FTS	Wellington Laboratories Code: 10:2FTS	1H,1H,2H,2H-perfluorododecane sulfonate (10:2)	48.2	200		964
NMeFOSAA	Wellington Laboratories Code: br-NMeFOSAA	N-methyl Perfluorooctane sulfonamidoacetic acid	50	200		1000
NEtFOSAA	Wellington Laboratories Code: br-NEtFOSAA	N-ethyl Perfluorooctane sulfonamidoacetic acid	50	200		1000
HFPO-DA	Wellington Laboratories Code: HFPO-DA	Hexafluoropropylene oxide dimer acid	50	200		1000
DONA	Wellington Laboratories Code: NaDONA	4,8-dioxa-3H-perfluorononanoic acid	47.1	200		942
9Cl-PF3ONS	Wellington Laboratories Code: 9Cl-PF3ONS	9-Chlorohexadecafluoro-3-oxanone-1-sulfonate	46.6	200		932
11Cl-PF3OUdS	Wellington Laboratories Code: 11Cl-PF3OUdS	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonate	47.1	200		942

Solvent: Methanol

PFAS Matrix Spike Solution 400 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (ng/mL)	Volume Added (mL)	Final Volume (mL)	Final Conc (ng/mL)
PFAS Matrix Spike Stock Solution	In-house	See above list	1000	2.0	5.0	400

Solvent: Methanol

PFAS MDL Spiking Solution 100 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (ng/mL)	Volume Added (mL)	Final Volume (mL)	Final Conc (ng/mL)
PFAS Matrix Spike Stock Solution	In-house	See above list	1000	0.10	1.0	100

Solvent: Methanol

PFAS-IDA Solution (Surrogate) 500 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (µg/mL)	Volume Added (µL)	Final Volume (mL)	Final Conc (ng/mL)
13C4 PFBA	Wellington Laboratories Code: MPFBA	$^{13}C_4$-Perfluorobutanoic acid	50	200		500
13C5-PFPeA	Wellington Laboratories Code: MPFPeA	$^{13}C_5$-Perfluoropentanoic acid	50	200		500
13C3-PFBS	Wellington Laboratories Code: M3PFBS	$^{13}C_3$-Perfluorobutanesulfonic acid	46.5	200		465
13C2 PFHxA	Wellington Laboratories Code: MPFHxA	$^{13}C_2$-Perfluorohexanoic acid	50	200		500
13C4 PFHpA	Wellington Laboratories Code: M4PFHpA	$^{13}C_4$-Perfluoroheptanoic acid	50	200		500
18O2 PFHxS	Wellington Laboratories Code: MPFHxS	$^{18}O_2$-Perfluorohexanesulfonic acid	47.3	200	20	473
13C4 PFOA	Wellington Laboratories Code: MPFOA	$^{13}C_4$-Perfluorooctanoic acid	50.0	200		500
13C5 PFNA	Wellington Laboratories Code: MPFNA	$^{13}C_5$-Perfluorononanoic acid	50.0	200		500
13C4 PFOS	Wellington Laboratories Code: MPFOS	$^{13}C_4$-Perfluorooctanesulfonic acid	47.8	200		478
13C2 PFDA	Wellington Laboratories Code: MPFDA	$^{13}C_2$-Perfluorodecanoic acid	50.0	200		500
13C8 FOSA	Wellington Laboratories Code: M8FOSA-I	$^{13}C_8$-Perfluorooctane sulfonamide	50.0	200		500

13C2 PFUdA	Wellington Laboratories Code: MPFUdA	$^{13}C_2$-Perfluoroundecanoic acid	50.0	200		500
13C2 PFDoA	Wellington Laboratories Code: MPFDoA	$^{13}C_2$-Perfluorododecanoic acid	50.0	200		500
13C2 PFTeDA	Wellington Laboratories Code: MPFTeDA	$^{13}C_2$-Perfluorotetradecanoic acid	50.0	200		500
13C2 PFHxDA	Wellington Laboratories Code: MPFHxDA	$^{13}C_2$-Perfluorohexadecanoic acid	50.0	200		500
M2-4:2FTS	Wellington Laboratories Code: M2-4:2FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]-hexane sulfonate (4:2)	46.7	200		467
M2-6:2FTS	Wellington Laboratories Code: M2-6:2FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]-octane sulfonate (6:2)	47.5	200		475
M2-8:2FTS	Wellington Laboratories Code: M2-8:2FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]-decane sulfonate (8:2)	47.9	200		479
d3-NMeFOSAA	Wellington Laboratories Code: d3-M-MeFOSAA	N-methyl-d_3-perfluoro-1-octane sulfonamidoacetic acid	50.0	200		500
d5-NEtFOSAA	Wellington Laboratories Code: d5-M-EtFOSAA	N-ethyl-d_5-perfluoro-1-octane sulfonamidoacetic acid	50.0	200		500
M3HFPO-DA	Wellington Laboratories Code: M3HFPO-DA	$^{13}C_3$-Hexafluoropropylene oxide dimer acid	50.0	200		500

Solvent: Methanol

PFAS Internal Standard Stock Solution 5000 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (µg/mL)	Volume Added (µL)	Final Volume (mL)	Final Conc (ng/mL)
13C2 PFOA	Wellington Laboratories Code: M2PFOA	$^{13}C_2$-Perfluorooctanoic acid	50.0	400	4	5000

Solvent: Methanol

PFAS Internal Standard Spiking Solution 1250 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (µg/mL)	Volume Added (mL)	Final Volume (mL)	Final Conc (ng/mL)
PFAS Internal Standard Stock Solution	In-house	$^{13}C_2$-Perfluorooctanoic acid	5.0	2.0	8.0	1250

Solvent: Methanol

PFAS-IDA-IS Calibration Standards Level 1-Level 6

ICAL Level	Vol of PFAS LCS/Matrix Spike Stock (µL)	Vol of PFAS MDL Spiking Solution (µL)	Nominal Conc of PFAS (ng/mL)	Vol of PFAS-IDA Solution (µL)	Conc of IDA (ng/mL)	Vol of 0.5ppm PFAS-IS Stock Solution (µL)	Conc of IS (ng/mL)	Vol of 80/20 MeOH/H2O (µL)	Final Vol (mL)
1	0	2	0.050	10	1.25	4	1.25	3988	4.0
2	0	2	0.10	5	1.25	2	1.25	1993	2.0
3	0	10	0.50	5	1.25	2	1.25	1985	2.0
4	12	0	1.0	30	1.25	12	1.25	11958	12.0
5	30	0	2.5	30	1.25	12	1.25	11940	12.0
6	20	0	10.0	5	1.25	2	1.25	1975	2.0

The solvent is 80/20 Methanol/Water.

Appendix C: Equations

Initial Calibration Curve Evaluation:

The linear curve uses the following function:

Equation 1

$$y = bx + c$$

Where:

y = $\frac{\text{Area (analyte)}}{\text{Area (IS)}} \times \text{Concentration (IS)}$
x = concentration
b = slope
c = intercept

The quadratic curve uses the following function:

Equation 2

$$y = ax^2 + bx + c$$

Where y, x, b, and c are the same as above, and a = curvature.

The external standard method uses the following equation:

Equation 3

$$ResponseFactor = \frac{Peak\ Area}{Concentration\ of\ Solution (ng/mL)}$$

Equation 4

$$\text{Concentration, ng/mL} = \frac{y - c}{b}$$

Equation 5

$$\text{Concentration, ng/mL} = \frac{-b + \sqrt{b^2 - 4a(c - y)}}{2a}$$

Where:

y = $\frac{\text{Area (analyte)}}{\text{Area (IS)}} \times \text{Concentration (IS)}$
x = concentration
a = curvature
b = slope
c = intercept

Water Sample Result Calculation:

Equation 6

$$\text{Concentration, ng/L} = \frac{C_{ex} V_t}{V_o}$$

Where:

C_{ex} = Concentration measured in sample extract (ng/mL)
V_t = Volume of total extract (mL)
V_o = Volume of water extracted (L)

IDA Recovery Calculation:

Equation 8

$$\%\,\mathrm{Recovery} = \frac{A_t Q_{is}}{A_{is} Q_t RRF_{IDA}} X 100$$

Where ng/g = µg/kg and:

RF_{IDA} = Response Factor for IDA compound
A_t = Area response for IDA compound
A_{IS} = Area Response for IS compound
Q_{IS} = Amount of IS added
Q_t = Amount of IDA added

Calibration Factor (CF_x) = Peak area or height $_{(x)}$ / Standard concentration $_{(\mu g/L)}$

Mean Calibration Factor ($\overline{CF}$) = $\frac{\sum_{i=1}^{n} CF_i}{n}$

where: n = number of calibration levels

Standard Deviation of the Calibration Factor (SD) = $\sqrt{\frac{\sum_{i=1}^{n}\left(CF_i - \overline{CF}\right)2}{n-1}}$

where: n = number of calibration levels

Percent Relative Standard Deviation (RSD) of the Calibration Factor = $\frac{SD}{\overline{CF}} \times 100\%$

Percent Difference (%D) = $\frac{CF_v - \overline{CF}}{\overline{CF}} \times 100\%$

where: CF_v = Calibration Factor from the Continuing Calibration Verification (CCV)

Percent Drift = Calculated Concentration – Theoretical Concentration / Theoretical Concentration x 100%

Percent Recovery (%R) = $\frac{C_s}{C_n} \times 100\%$

where: C_s = Concentration of the Spiked Field or QC Sample
C_n = Nominal Concentration of Spike Added

Percent Recovery (%R) for MS/MSD = $\frac{C_s - C_u}{C_n} \times 100\%$

where: C_s = Concentration of the Spiked Sample
C_u = Concentration of the Unspiked Sample
C_n = Nominal Concentration of Spike Added

Relative Percent Difference (%RPD) = $\frac{|C_1 - C_2|}{\left(\frac{C_1 + C_2}{2}\right)} \times 100\%$

where: C_1 = Measured Concentration of First Sample
C_2 = Measured Concentration of Second Sample

Sample Concentration

Extract

$C_{extract}$ (µg/L) = $\frac{\text{Peak Area (or Height)}}{\overline{CF}}$

Note: The concentrations of the 3-5 peaks chosen for quantificaton is calculated and the average is then taken for final calculation.

Appendix D: Analytes applied for Secondary Certification with NJDEP

Compound Name	Abbreviation	CAS #
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorononanoic acid	PFNA	375-95-1
Perfluorodecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUdA (PFUnA)	2058-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTeDA (PFTA)	376-06-7
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluorooctanesulfonic acid	PFOS	1763-23-1

Soil & GW Limits for 1,4-Dioxane

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
SO - 1,4-Dioxane	Semivolatile Organic Compounds (GC/MS)	8270E	3546	1,4-Dioxane	123-91-1	0.0330	0.0289		mg/Kg	31	81	30	31	81	30		
GW - 1,4-Dioxane	Semivolatile Organic Compounds (GC/MS SIM / Isotope Dilution)	8270E_SIM_MS_ID	3510C_LVI	1,4-Dioxane	123-91-1	0.200	0.0160		ug/L	10	200	50	70	130	20		

Soil & GW PFAS Limits - Burlington lab

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
SO - PFAS	Fluorinated Alkyl Substances	PFC_IDA	Shake_Bath_14D	Perfluorobutanoic acid (PFBA)	375-22-4	0.500	0.161		ug/Kg	70	130	20	70	130	20		
				Perfluoropentanoic acid (PFPeA)	2706-90-3	0.200	0.0390		ug/Kg	70	130	20	70	130	20		
				Perfluorohexanoic acid (PFHxA)	307-24-4	0.200	0.0220		ug/Kg	70	130	20	70	130	20		
				Perfluoroheptanoic acid (PFHpA)	375-85-9	0.200	0.0200		ug/Kg	70	130	20	70	130	20		
				Perfluorooctanoic acid (PFOA)	335-67-1	0.200	0.0250		ug/Kg	70	130	20	70	130	20		
				Perfluorononanoic acid (PFNA)	375-95-1	0.200	0.0180		ug/Kg	70	130	20	70	130	20		
				Perfluorodecanoic acid (PFDA)	335-76-2	0.200	0.0120		ug/Kg	70	130	20	70	130	20		
				Perfluoroundecanoic acid (PFUnA)	2058-94-8	0.200	0.0200		ug/Kg	70	130	20	70	130	20		
				Perfluorododecanoic acid (PFDoA)	307-55-1	0.200	0.0210		ug/Kg	70	130	20	70	130	20		
				Perfluorotridecanoic acid (PFTriA)	72629-94-8	0.200	0.0150		ug/Kg	70	130	20	70	130	20		
				Perfluorotetradecanoic acid (PFTeA)	376-06-7	0.200	0.0230		ug/Kg	70	130	20	70	130	20		
				Perfluorobutanesulfonic acid (PFBS)	375-73-5	0.200	0.00930		ug/Kg	70	130	20	70	130	20		
				Perfluorohexanesulfonic acid (PFHxS)	355-46-4	0.200	0.0140		ug/Kg	70	130	20	70	130	20		
				Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.200	0.0150		ug/Kg	70	130	20	70	130	20		
				Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.200	0.0160		ug/Kg	70	130	20	70	130	20		
				Perfluorodecanesulfonic acid (PFDS)	335-77-3	0.200	0.0120		ug/Kg	70	130	20	70	130	20		
				Perfluorooctanesulfonamide (PFOSA)	754-91-6	0.200	0.0170		ug/Kg	70	130	20	70	130	20		
				N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9	2.00	0.0370		ug/Kg	70	130	20	70	130	20		
				N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6	2.00	0.0460		ug/Kg	70	130	20	70	130	20		
				1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	27619-97-2	2.00	0.0310		ug/Kg	70	130	20	70	130	20		
				1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	39108-34-4	2.00	0.0160		ug/Kg	70	130	20	70	130	20		
				18O2 PFHxS	STL00994				ug/Kg								
				13C4 PFHpA	STL01892				ug/Kg								
				13C4 PFOA	STL00990				ug/Kg								
				13C4 PFOS	STL00991				ug/Kg								
				13C5 PFNA	STL00995				ug/Kg								
				13C4 PFBA	STL00992				ug/Kg								
				13C2 PFHxA	STL00993				ug/Kg								
				13C2 PFDA	STL00996				ug/Kg								
				13C2 PFUnA	STL00997				ug/Kg								
				13C2 PFDoA	STL00998				ug/Kg								
				13C8 FOSA	STL01056				ug/Kg								
				13C5 PFPeA	STL01893				ug/Kg								
				13C2 PFTeDA	STL02116				ug/Kg								
				d3-NMeFOSAA	STL02118				ug/Kg								
				d5-NEtFOSAA	STL02117				ug/Kg								
				M2-6:2 FTS	STL02279				ug/Kg								
				M2-8:2 FTS	STL02280				ug/Kg								
				13C3 PFBS	STL02337				ug/Kg								
				13C2 PFOA	STL00623				ug/Kg								

GW - PFAS	Fluorinated Alkyl Substances	PFC_IDA	3535_IVWT	Perfluorobutanoic acid (PFBA)	375-22-4	5.00	0.893	1.20	ng/L	50	150	30	40	160	30		
				Perfluoropentanoic acid (PFPeA)	2706-90-3	2.00	0.474	1.20	ng/L	50	150	30	40	160	30		
				Perfluorohexanoic acid (PFHxA)	307-24-4	2.00	0.452	1.20	ng/L	70	130	20	40	160	20		
				Perfluoroheptanoic acid (PFHpA)	375-85-9	2.00	0.238	1.20	ng/L	70	130	20	40	160	20		
				Perfluorooctanoic acid (PFOA)	335-67-1	2.00	0.424	1.20	ng/L	70	130	20	40	160	20		
				Perfluorononanoic acid (PFNA)	375-95-1	2.00	0.281	1.20	ng/L	70	130	20	40	160	20		
				Perfluorodecanoic acid (PFDA)	335-76-2	2.00	0.304	1.20	ng/L	70	130	20	40	160	20		
				Perfluoroundecanoic acid (PFUnA)	2058-94-8	2.00	0.344	1.20	ng/L	70	130	20	40	160	20		
				Perfluorododecanoic acid (PFDoA)	307-55-1	2.00	0.385	1.20	ng/L	70	130	20	40	160	20		
				Perfluorotridecanoic acid (PFTriA)	72629-94-8	2.00	0.434	1.20	ng/L	70	130	20	40	160	20		
				Perfluorotetradecanoic acid (PFTeA)	376-06-7	2.00	0.632	1.20	ng/L	70	130	20	40	160	20		
				Perfluorobutanesulfonic acid (PFBS)	375-73-5	2.00	0.250	1.06	ng/L	70	130	20	40	160	20		
				Perfluorohexanesulfonic acid (PFHxS)	355-46-4	2.00	0.302	1.09	ng/L	70	130	20	40	160	20		
				Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	2.00	0.234	1.14	ng/L	50	150	30	40	160	30		
				Perfluorooctanesulfonic acid (PFOS)	1763-23-1	2.00	0.291	1.11	ng/L	70	130	20	40	160	20		
				Perfluorodecanesulfonic acid (PFDS)	335-77-3	2.00	0.306	1.16	ng/L	50	150	30	40	160	30		
				Perfluorooctanesulfonamide (PFOSA)	754-91-6	2.00	0.577	1.20	ng/L	50	150	30	40	160	30		
				N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9	5.00	0.903	1.20	ng/L	70	130	20	40	160	20		
				N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6	5.00	0.743	1.20	ng/L	70	130	20	40	160	20		
				1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	27619-97-2	5.00	1.10	1.14	ng/L	50	150	30	40	160	30		
				1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	39108-34-4	2.00	0.390	1.15	ng/L	50	150	30	40	160	30		
				18O2 PFHxS	STL00994				ng/L				25	150			
				13C4 PFHpA	STL01892				ng/L				25	150			
				13C4 PFOA	STL00990				ng/L				25	150			
				13C4 PFOS	STL00991				ng/L				25	150			
				13C5 PFNA	STL00995				ng/L				25	150			
				13C4 PFBA	STL00992				ng/L				25	150			
				13C2 PFHxA	STL00993				ng/L				25	150			
				13C2 PFDA	STL00996				ng/L				25	150			
				13C2 PFUnA	STL00997				ng/L				25	150			
				13C2 PFDoA	STL00998				ng/L				25	150			
				13C8 FOSA	STL01056				ng/L				25	150			
				13C5 PFPeA	STL01893				ng/L				25	150			
				13C2 PFTeDA	STL02116				ng/L				25	150			
				d3-NMeFOSAA	STL02118				ng/L				25	150			
				d5-NEtFOSAA	STL02117				ng/L				25	150			
				M2-6:2 FTS	STL02279				ng/L				25	150			
				M2-8:2 FTS	STL02280				ng/L				25	150			
				13C3 PFBS	STL02337				ng/L				25	150			
				13C2 PFOA	STL00623				ng/L				25	150			

ATTACHMENT 4

Roux's Standard Operating Procedures

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for decontamination of all field equipment potentially exposed to contamination during drilling, and soil and water sampling. The objective of decontamination is to ensure that all drilling, and soil-sampling and water-sampling equipment is decontaminated (free of potential contaminants): 1) prior to being brought onsite to avoid the introduction of potential contaminants to the site; 2) between drilling and sampling events/activities onsite to eliminate the potential for cross-contamination between boreholes and/or wells; and 3) prior to the removal of equipment from the site to prevent the transportation of potentially contaminated equipment offsite.

In considering decontamination procedures, state and federal regulatory agency requirements must be considered because of potential variability between state and federal requirements and because of variability in the requirements of individual states. Decontamination procedures must be in compliance with state and/or federal protocols in order that regulatory agency(ies) scrutiny of the procedures and data collected do not result in non acceptance (invalidation) of the work undertaken and data collected.

2.0 PROCEDURE FOR DRILLING EQUIPMENT

The following is a minimum decontamination procedure for drilling equipment. Drilling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

2.1 The rig and all associated equipment should be properly decontaminated by the contractor before arriving at the test site.

2.2 The augers, drilling casings, rods, samplers, tools, rig, and any piece of equipment that can come in contact (directly or indirectly) with the soil, will be steam cleaned onsite prior to set up for drilling to ensure proper decontamination.

2.3 The same steam cleaning procedures will be followed between boreholes (at a fixed on-site location[s], if appropriate) and before leaving the site at the end of the study.

2.4 All on-site steam cleaning (decontamination) activities will be monitored and documented by a member(s) of the staff of Roux Associates, Inc.

2.5 If drilling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat drilling equipment, then special decontamination procedures may have to be utilized before steam cleaning (e.g., hexane scrub and wash).

2.6 Containment of decontamination fluids may be necessary (e.g., rinseate from steam cleaning) or will be required (e.g., hexane), and disposal must be in accordance with state and/or federal procedures.

3.0 PROCEDURE FOR SOIL-SAMPLING EQUIPMENT

The following is a minimum decontamination procedure for soil-sampling equipment (e.g., split spoons, stainless-steel spatulas). Soil-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

3.1 Wear disposable gloves while cleaning equipment to avoid cross-contamination and change gloves as needed.

3.2 Steam clean the sampler or rinse with potable water. If soil-sampling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat sampling equipment, then special decontamination procedures may have to be utilized before steam cleaning and washing in detergent solution (e.g., hexane scrub and wash).

3.3 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or potable water in a clean bucket.

3.4 Disassemble the sampler, as necessary and immerse all parts and other sampling equipment in the solution.

3.5 Scrub all equipment in the bucket with a brush to remove any adhering particles.

3.6 Rinse all equipment with copious amounts of potable water followed by distilled or deionized water.

3.7 Place clean equipment on a clean plastic sheet (e.g., polyethylene)

3.8 Reassemble the cleaned sampler, as necessary.

3.9 Transfer the sampler to the driller (or helper) making sure that this individual is also wearing clean gloves, or wrap the equipment with a suitable material (e.g., plastic bag, aluminum foil.

As part of the decontamination procedure for soil-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

4.0 PROCEDURE FOR WATER-SAMPLING EQUIPMENT

The following is a decontamination procedure for water-sampling equipment (e.g., bailers, pumps). Water-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

4.1 Decontamination procedures for bailers follow:

a. Wear disposable gloves while cleaning bailer to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a bucket.

c. Disassemble bailer (if applicable) and discard cord in an appropriate manner, and scrub each part of the bailer with a brush and solution.

d. Rinse with potable water and reassemble bailer.

e. Rinse with copious amounts of distilled or deionized water.

f. Air dry.

g. Wrap equipment with a suitable material (e.g., clean plastic bag, aluminum foil).

h. Rinse bailer at least three times with distilled or deionized water before use.

4.2 Decontamination procedures for pumps follow:

a. Wear disposable gloves while cleaning pump to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a clean bucket, clean garbage can, or clean 55-gallon drum.

c. Flush the pump and discharge hose (if not disposable) with the detergent solution, and discard disposable tubing and/or cord in an appropriate manner.

d. Flush the pump and discharge hose (if not disposable) with potable water.

e. Place the pump on clear plastic sheeting.

f. Wipe any pump-related equipment (e.g., electrical lines, cables, discharge hose) that entered the well with a clean cloth and detergent solution, and rinse or wipe with a clean cloth and potable water.

g. Air dry.

h. Wrap equipment with a suitable material (e.g., clean plastic bag).

As part of the decontamination procedure for water-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

Date: May 5, 2000

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidelines for the collection of soil samples for laboratory analysis. This SOP is applicable to soil samples collected from split-spoon samplers during drilling, hand auger samples, grab samples from stockpiled soils, surface samples, test pit samples, etc.

2.0 CONSIDERATIONS

Soil samples may be collected in either a random or biased manner. Random samples can be based on a grid system or statistical methodology. Biased samples can be collected in areas of visible impact or suspected source areas. Soil samples can be collected at the surface, shallow subsurface, or at depth. When samples are collected at depth the water content should be noted, since generally "soil sampling" is restricted to the unsaturated zone. Equipment selection will be determined by the depth of the sample to be collected. A thorough description of the sampling locations and proposed methods of sample collection should be included in the work plan.

Commonly, surface sampling refers to the collection of samples at a 0 to 6 inch depth interval. Certain regulatory agencies may define the depth interval of a surface sample differently, and this must be defined in the work plan. Collection of surface soil samples is most efficiently accomplished with the use of a stainless steel trowel or scoop. For samples at greater depths a decontaminated bucket auger or power auger may be needed to advance the hole to the point of sample collection. Another clean bucket auger should then be used to collect the sample. To collect samples at depths of greater than approximately six feet the use of a drill rig and split spoon samples will usually be necessary. In some situations, sample locations are accessed with the use of a backhoe.

3.0 MATERIALS/EQUIPMENT

a. A work plan which outlines soil sampling requirements.

b. Field notebook, field form(s), maps, chain-of-custody forms, and custody seals.

c. Decontamination supplies (including: non-phosphate, laboratory grade detergent, buckets, brushes, potable water, distilled water, regulatory-required reagents, aluminum foil, plastic sheeting, etc.).

d. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

e. Stainless steel spoons or spatulas.

f. Disposable sampling gloves.

g. Laboratory-supplied sample containers with labels.

h. Cooler with blue or wet ice.

i. Plastic sheeting.

j. Black pen and indelible marker.

k. Zip-lock bags and packing material.

l. Tape measure.

m. Paper towels or clean rags.

n. Masking and packing tape.

o. Overnight (express) mail forms.

4.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP. Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves, aluminum foil, and plastic sheeting will be changed after each use and discarded in an appropriate manner.

5.0 PROCEDURE

5.1 Prior to collecting soil samples, ensure that all sampling equipment has been thoroughly cleaned according to the decontamination SOP. If samples are to be collected at depth, then the boring must be advanced with thoroughly cleaned equipment to the desired sampling horizon and a different thoroughly cleaned sampler must be used to collect the sample.

5.2 Using disposable gloves and a pre-cleaned, stainless steel spatula or spoon, extract the soil sample from the sampler, measure the recovery, and separate the wash from the true sample. Where allowed by regulatory agency(ies), disposable plastic spoons may be used.

5.3 Place the sample in a laboratory-supplied, pre-cleaned sample container. This should be done as quickly as possible and this is especially important when sampling for volatile organic compounds (VOCs). Samples to be analyzed for VOCs must be collected prior to other constituents.

5.4 The sample container will be labeled with appropriate information such as, client name, site location, sample identification (location, depth, etc.), date and time of collection, and sampler's initials.

5.5 Using the remaining portion of soil from the sampler, log the sample in detail and record sediment characteristics (color, odor, moisture, texture, density, consistency, organic content, layering, grain size, etc.).

5.6 If soil samples are to be composited in the field, then equal portions from selected locations will be placed on a clean plastic sheet and homogenized. Alternately, several samples may be submitted to the laboratory for compositing by weight. The method used is dependent upon regulatory requirements. Specific compositing procedures shall be approved by the appropriate regulatory agency and described in the work plan. Samples to be analyzed for VOCs will not be composited unless required by a regulatory agency.

5.7 After the sample has been collected, labeled, and logged in detail, it is placed in a zip-lock bag and stored in a cooler at 4°C.

5.8 A chain-of-custody form is completed for all samples collected. One copy is retained and two are sent with the samples in a zip-lock bag to the laboratory. A custody seal is placed on the cooler prior to shipment.

5.9 Samples collected from Monday to Friday are to be delivered to the laboratory within 24 hours of collection. If Saturday delivery is unavailable, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if any analytes require a shorter delivery time.

5.10 The field notebook and appropriate forms should include, but not be limited to the following: client name, site location, sample location, sample depth, sample identification, date and time collected, sampler's name, method of sample collection, number and type of containers, geologic description of material, description of decontamination procedures, etc. A site map should be prepared with exact measurements to each sample location in case follow-up sampling is necessary.

5.11 All reusable sampling equipment must be thoroughly cleaned in accordance with the decontamination SOP. Following the final decontamination (after all samples are collected) the sampling equipment is wrapped in aluminum foil. Discard any gloves, foil, plastic, etc. in an appropriate manner that is consistent with site conditions.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sample handling which will allow consistent and accurate results. Valid chemistry data are integral to investigations that characterize media-quality conditions. Thus, this SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner which will maintain sample integrity to as great an extent as possible. The procedures outlined are applicable to most sampling events and any required modifications must be clearly described in the work plan.

2.0 CONSIDERATIONS

Sample containers, sampling equipment decontamination, quality assurance/quality control (QA/QC), sample preservation, and sample handling are all components of this SOP.

2.1 Sample Containers

Prior to collection of a sample, considerations must be given to the type of container that will be used to store and transport the sample. The type and number of containers selected is usually based on factors such as sample matrix, potential contaminants to be encountered, analytical methods requested, and the laboratory's internal quality assurance requirements. In most cases, the overriding considerations will be the analytical methodology, or the state or federal regulatory requirements because these regulations generally encompass the other factors. The sample container selected is usually based on some combination of the following criteria:

a. Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample.

In some instances, however, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of the glass containers in an aqueous matrix, plastic bottles (e.g., nalgene) must be used for samples collected for metals analysis. A separate, plastic

container should accompany glass containers if metals analysis is to be performed along with other analyses. Likewise, other sample characteristics may dictate that glass cannot be used. For example, in the case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the container's surface.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analysis being performed and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual laboratories may provide larger volume containers for various analytes to ensure sufficient quantities for duplicates or other QC checks.

To facilitate transfer of the sample from the sampler into the container and to minimize spillage and sample disturbance, wide-mouth containers are recommended. Aqueous volatile organic samples must be placed into 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., TeflonTM) septums. Non-aqueous volatile organic samples should be collected in the same type of vials or in 4-ounce (oz) wide-mouth jars provided by the laboratory. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, then containers holding samples should be protected from light (i.e., place in cooler with ice immediately after filling).

d. Container Closures

Container closures must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample, and the container cap must be replaced (securely) immediately after filling it. Closures should be constructed of a material which is inert with respect to the sampled material, such as PTFE (e.g., TeflonTM). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE sheeting. If soil or sediment samples are being collected, the threads of the container must be wiped clean with a dedicated paper towel or cloth so the cap can be threaded properly.

e. Decontamination of Sample Containers

Sample containers must be laboratory cleaned by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample. Sample containers must be carefully examined to ensure that all containers appear clean. Do not mistake the preservative as unwanted residue. The bottles should not be field cleaned. If there is any question regarding the integrity of the bottle, then the laboratory must be contacted immediately and the bottle(s) replaced.

f. Sample Bottle Storage and Transport

No matter where the sample bottles are, whether at the laboratory waiting to be packed for shipment or in the field waiting to be filled with sample, care must be taken to avoid contamination. Sample shuttles or coolers, and sample bottles must be stored and transported in clean environments. Sample bottles and clean sampling equipment must never be stored near solvents, gasoline, or other equipment that is a potential source of cross-contamination. When under chain of custody, sample bottles must be secured in locked vehicles, and custody sealed in shuttles or in the presence of authorized personnel. Information which documents that proper storage and transport procedures have been followed must be included in the field notebook and on appropriate field forms.

2.2 Decontamination of Sampling Equipment

Proper decontamination of all re-usable sampling equipment is critical for all sampling episodes. The SOP for Decontamination of Field Equipment and SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for decontamination of various types of equipment.

2.3 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and tracking of environmental measurements, and subsequent review, interpretation and validation of generated analytical data. The SOPs for Collection of Quality Control Samples, for Evaluation and Validation of Data, and for Field Record Keeping and Quality Assurance/Quality Control must be referred to for detailed guidance regarding these respective procedures. SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for QA/QC procedures.

2.4 Sample Preservation Requirements

Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Generally, this is accomplished under the following two scenarios:

a. Sample bottles are preserved at the laboratory prior to shipment into the field.

b. Preservatives are added in the field immediately after the samples are collected.

Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample could be collected, resulting in too much preservative in the sample. More commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles. The use of pre-preserved bottles is acceptable; however, field sampling teams must always be prepared to add additional preservatives to samples if the aforementioned situations occur. Furthermore, care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling and therefore diluting the preservative (i.e., not having enough preservative for the volume of sample).

When samples are preserved after collection, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher-grade.

2.5 Sample Handling

After the proper sample bottles have been received under chain-of-custody, properly decontaminated equipment has been used to collect the sample, and appropriate preservatives have been added to maintain sample integrity, the final step for the field personnel is checking the sample bottles prior to proper packing and delivery of the samples to the laboratory.

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness and any 40-ml volatile organic compound (VOC) bottles must be checked for bubbles. Each sample bottle must be placed in an individual "zip-lock" bag to protect the label, and placed on ice. The bottles must be carefully packed to prevent breakage during transport. When several bottles have been collected for an individual sample, they should not be placed adjacent to each other in the cooler to prevent possible breakage of all bottles for a given sample. If there are any samples which are known or suspected to be highly

contaminated, these should be placed in an individual cooler under separate chain-of-custody to prevent possible cross contamination. Sufficient ice (wet or blue packs) should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery at the laboratory. Consult the work plan to determine if a particular ice is specified as the preservation for transportation (e.g., the United States Environmental Protection Agency does not like the use of blue packs because they claim that the samples will not hold at 4°C). Blue ice packs will not be used to transport samples being analyzed for Per- and Polyfluoroalkyl Substances (PFAS). If additional coolers are required, then they should be purchased. The chain-of-custody form should be properly completed, placed in a "zip-lock" bag, and placed in the cooler. One copy must be maintained for the project files. The cooler should be sealed with packing tape and a custody seal. The custody seal number should be noted in the field book. Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time. If overnight mail is utilized, then the shipping bill must be maintained for the files and the laboratory must be called the following day to confirm receipt.

3.0 EQUIPMENT AND MATERIALS

3.1 General equipment and materials may include, but not necessarily be limited to, the following:

a. Sample bottles of proper size and type with labels.

b. Cooler with ice (wet or blue pack; no blue packs for PFAS samples).

c. Field notebook, appropriate field form(s), chain-of-custody form(s), custody seals.

d. Black pen and indelible marker.

e. Packing tape, "bubble wrap," and "zip-lock" bags.

f. Overnight (express) mail forms and laboratory address.

g. Health and safety plan (HASP).

h. Work plan/scope of work.

i. Pertinent SOPs for specified tasks and their respective equipment and materials.

3.2 Preservatives for specific samples/analytes as specified by the laboratory. Preservatives must be stored in secure, spillproof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous equipment and materials including, but not necessarily limited to, the following:

a. Graduated pipettes.

b. Pipette bulbs.

c. Litmus paper.

d. Glass stirring rods.

e. Protective goggles.

f. Disposable gloves.

g. Lab apron.

h. First aid kit.

i. Portable eye wash station.

j. Water supply for immediate flushing of spillage, if appropriate.

k. Shovel and container for immediate containerization of spillage-impacted soils, if appropriate.

4.0 PROCEDURE

4.1 Examine all bottles and verify that they are clean and of the proper type, number, and volume for the sampling to be conducted.

4.2 Label bottles carefully and clearly with project name and number, site location, sample identification, date, time, and the sampler's initials using an indelible marker.

4.3 Collect samples in the proper manner (refer to specific sampling SOPs).

4.4 Conduct preservation activities as required after each sample has been collected. Field preservation must be done immediately and must not be done later than 30 minutes after sample collection.

4.5 Conduct QC sampling, as required.

4.6 Seal each container carefully and place in an individual "zip lock" bag.

4.7 Organize and carefully pack all samples in the cooler immediately after collection (e.g., bubble wrap). Insulate samples so that breakage will not occur.

4.8 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment or delivery to the laboratory, it may be easier to tape the chain-of-custody to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody as a courtesy to the laboratory personnel.

4.9 Add additional ice as necessary to ensure that it will last until receipt by the laboratory.

4.10 Seal the cooler with packing tape and a custody seal. Record the number of the custody seal in the field notebook and on the field form. If there are any exceptionally hazardous samples, then shipping regulations should be examined to ensure that the sample containers and coolers are in compliance and properly labeled.

4.11 Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time.

4.12 Maintain the shipping bill for the project files if overnight mail is utilized and call the laboratory the following day to confirm receipt.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for the sampling of ground-water monitoring wells for dissolved constituents. As part of the SOP for the sampling of ground-water monitoring wells, sample collection equipment and devices must be considered, and equipment decontamination and pre-sampling procedures (e.g., measuring water levels, sounding wells, and purging wells) must be implemented. Sampling objectives must be firmly established in the work plan before considering the above.

Valid water-chemistry data are integral to a hydrogeologic investigation that characterizes ground-water quality conditions. Water-quality data are used to evaluate both current and historic aquifer chemistry conditions, as well as to estimate future conditions (e.g., trends, migration pathways). Water-quality data can be used to construct ground-water quality maps to illustrate chemical conditions within the flow system, to generate water-quality plots to depict conditions with time and trends, and to perform statistical analyses to quantify data variability, trends, and cleanup levels.

2.0 EQUIPMENT AND MATERIALS

2.1 In order to sample ground water from monitoring wells, specific equipment and materials are required. The equipment and materials list may include, but not necessarily be limited to, the following:

a. Bailers (Teflon™ or stainless steel).

b. Pumps (centrifugal, peristaltic, bladder, electric submersible, bilge, hand-operated diaphragm, etc.).

c. Gas-displacement device(s).

d. Air-lift device(s).

e. Teflon™ tape, electrical tape.

f. Appropriate discharge hose.

g. Appropriate discharge tubing (e.g., polypropylene, teflon, etc.) if using a peristaltic pump.

h. Appropriate compressed gas if using bladder-type or gas-displacement device.

i. Portable generator and gasoline or alternate power supply if using an electric submersible pump.

j. Non-absorbent cord (e.g., polypropylene, etc.).

k. Plastic sheeting.

l. Tape measure (stainless steel, steel, fiberglass) with 0.01-foot measurement increments and chalk (blue carpenter's).

m. Electronic water-level indicators (e.g., m-scope, etc.) or electric water-level/product level indicators.

n. Non-phosphate, laboratory-grade detergent.

o. Distilled/Deionized water.

p. Potable water.

q. Paper towels, clean rags.

r. Roux Associates' field forms (e.g., daily log, well inspection checklist, sampling, etc.) and field notebook.

s. Well location and site map.

t. Well keys.

u. Stop watch, digital watch with second increments, or watch with a second hand.

v. Water Well Handbook.

w. Calculator.

x. Black pen and water-proof marker.

y. Tools (e.g., pipe wrenches, screwdrivers, hammer, pliers, flashlight, pen knife, etc.).

z. Appropriate health and safety equipment, as specified in the site health and safety plan (HASP).

aa. pH meter(s) and buffers.

bb. Conductivity meter(s) and standards.

cc. Thermometer(s).

dd. Extra batteries (meters, thermometers, flashlight).

ee. Filtration apparatus, filters, pre-filters.

ff. Plasticware (e.g., premeasured buckets, beakers, flasks, funnels).

gg. Disposable gloves.

hh. Water jugs.

ii. Laboratory-supplied sample containers with labels.

jj. Cooler(s).

kk. Ice (wet, blue packs).

ll. Masking, duct, and packing tape.

mm. Chain-of-custody form(s) and custody seal(s).

nn. Site sampling and analysis plan (SAP).

oo. Site health and safety plan (HASP).

pp. Packing material (e.g., bubble wrap)

qq. "Zip-lock" plastic bags.

rr. Overnight (express) mail forms.

3.0 DECONTAMINATION

3.1 Make sure all equipment is decontaminated and cleaned before use (refer to the SOP for Decontamination of Field Equipment for detailed decontamination methods, summaries for bailers and pumps are provided below). Use new, clean materials when decontamination is not appropriate (e.g., non-absorbent cord, disposable gloves). Document, and initial and date the decontamination procedures on the appropriate field form and in the field notebook.

a. Decontaminate a bailer by: 1) wearing disposable gloves, 2) disassembling (if appropriate) and scrubbing in a non-phosphate, laboratory-grade detergent and distilled/deionized water solution, and 3) rinsing first with potable water and then distilled/deionized water.

b. Decontaminate a pump by: 1) wearing disposable gloves, 2) flushing the pump and discharge hose (if not disposable) first with a non-phosphate, laboratory-grade detergent and potable water solution in an appropriate

container (clean bucket, garbage can, or 55-gallon drum) and then with distilled/deionized water or potable water, and 3) wiping pump-related equipment (e.g., electrical lines, cables, discharge hose) first with a clean cloth and detergent solution and then rinsing or wiping with a clean cloth and distilled/deionized water or potable water.

3.2 Note that the decontamination procedures for bailers and pumps are the minimum that must be performed. Check the work plan to determine if chemicals specified by individual state regulatory agencies must also be used for decontamination procedures (e.g., hexane, nitric acid, acetone, isopropanol, etc.).

4.0 CALIBRATION OF FIELD ANALYSIS EQUIPMENT

Calibrate field analysis equipment before use (e.g., thermometers, pH and conductivity meters, etc.). Refer to the specific SOP for field analysis for each respective piece of equipment. Document, and initial and date the calibration procedures on the appropriate field form, in the field notebook, and in the calibration log book.

5.0 PROCEDURE

5.1 Document, and initial and date well identification, pre-sampling information, and problems encountered on the appropriate field form and in the field notebook as needed.

5.2 Inspect the protective casing of the well and the well casing, and note any items of concern such as a missing lock, or bent or damaged casing(s).

5.3 Place plastic sheeting around the well to protect sampling equipment from potential cross contamination.

5.4 Remove the well cap or plug and, if necessary, clean the top of the well off with a clean rag. Place the cap or plug on the plastic sheeting. If the well is not vented, allow several minutes for the water level in the well to equilibrate. If fumes or gases are present, then diagnose these with the proper safety equipment. Never inhale the vapors.

5.5 Measure the depth to water (DTW) from the measuring point (MP) on the well using a steel tape and chalk or an electronic sounding device (m-scope). Refer to the specific SOPs for details regarding the use of a steel tape or a m-scope for measuring water levels. Calculate the water-level elevation. Document, and initial and date the information on the appropriate field form and in the field notebook.

5.6 Measuring the total depth of the well from the MP with a weighted steel tape. Calculate and record the volume of standing water in the well casing on the appropriate field form and in the field notebook.

5.7 Decontaminate the equipment used to measure the water level and sound the well with a non-phosphate, laboratory-grade detergent solution followed by a distilled/deionized water rinse.

5.8 Purge the well prior to sampling (refer to the SOP for Purging a Well). The well should be pumped or bailed to remove the volume of water specified in the work plan. Usually three to five casing volumes are removed if the recharge rate is adequate to accomplish this within a reasonable amount of time.

If the formation cannot produce enough water to sustain purging, then one of two options must be followed. These include: 1) pumping or bailing the well dry, or 2) pumping or bailing the well to "near-dry" conditions (i.e., leaving some water in the well). The option employed must be specified in the work plan and be in accordance with regulatory requirements.

If the well is purged dry, then all the standing water has been removed and upon recovery the well is ready for sampling. However, depending on the rate of recovery and the time needed to complete the sampling round, one of the following procedures may have to be implemented: 1) the well may have to be sampled over a period of more than one day; 2) the well may not yield enough water to collect a complete suite of samples and only select (most important) samples will be collected; or 3) the well may not recover which will preclude sampling. Regardless of the option that must be followed, the sampling procedure must be fully documented. When preparing to conduct a sampling round, review drilling, development and previous sampling information (if available) to identify low-yielding wells in order to purge them first, and potentially allow time for the well to recover for sampling.

5.9 Record the physical appearance of the water (i.e., color, turbidity, odor, etc.) on the appropriate field form and in the field notebook, as it is purged. Note any changes that occur during purging.

5.10 If a bailer is used to collect the sample, then:

a. Flush the decontaminated bailer three times with distilled/deionized water.

b. Tie the non-absorbent cord (polypropylene) to the bailer with a secure knot and then tie the free end of the bailer cord to the protective casing or, if possible, some nearby structure to prevent losing the bailer and cord down the well.

c. Lower the bailer slowly down the well and into the water column to minimize disturbance of the water surface. If a bottom-filling bailer is used, then do not submerge the top of the bailer; however, if a top-filling bailer is used, then submerge the bailer several feet below the water surface.

d. Remove and properly discard one bailer volume from the well to rinse the bailer with well water before sampling. Again, lower the bailer slowly down the well to the appropriate depth depending on the bailer type (as discussed above in 5.11 c). When removing the bailer from the well, do not allow the bailer cord to rest on the ground but coil it on the protective plastic sheeting placed around the well. Certain regulatory agencies require that the first bailer volume collected be utilized for the samples.

5.11 If a pump is used to collect the sample, then use the same pump used to purge the well and, if need be, reduce the discharge rate to facilitate filling sample containers and to avoid problems that can occur while filling sample containers (as listed in Number 5.14, below). Alternately, the purge pump may be removed and a thoroughly decontaminated bailer can be used to collect the sample.

5.12 Remove each appropriate container's cap only when ready to fill each with the water sample, and then replace and secure the cap immediately.

5.13 Fill each appropriate, pre-labeled sample container carefully and cautiously to prevent: 1) agitating or creating turbulence; 2) breaking the container; 3) entry of, or contact with, any other medium; and 4) spilling/splashing the sample and exposing the sampling team to contaminated water. Immediately place the filled sample container in a ice-filled (wet ice or blue pack) cooler for storage. If wet ice is used it is recommended that it be repackaged in zip-lock bags to help keep the cooler dry and the sample labels secure. Check the work plan as to whether wet ice or blue packs are specified for cooling the samples because certain regulatory agencies may specify the use of one and not the other.

5.14 "Top-off" containers for volatile organic compounds (VOCs) and tightly seal with Teflon™-lined septums held in place by open-top screw caps to prevent volatilization. Ensure that there are no bubbles by turning the container upside down and tapping it gently.

5.15 Filter water samples (Procedure 4.6) collected for dissolved metals analysis prior to preservation to remove the suspended sediment from the sample. If water samples are to be collected for total metals analysis, then collect a second set of samples without field filtering.

In the event that the regulatory agency(ies) want unfiltered samples for metals analysis, a second set of filtered samples should also be collected. Because unfiltered samples are indications of total metals (dissolved and suspended) they are not representative of aquifer conditions because ground water does not transport sediment (except in some rare cases). Thus, the results for dissolved metals in ground water should be based on filtered samples even if both filtered and unfiltered sets are presented in a report.

5.16 Add any necessary preservative(s) to the appropriate container(s) prior to, or after (preferred), the collection of the sample, unless the appropriate preservative(s) have already been added by the laboratory before shipment.

5.17 Collect quality control (QC) samples as required in the work plan to monitor sampling and laboratory performance. Refer to the SOP for Collection of Quality Control Samples.

5.18 Conduct field analyses after sample collection is complete by measuring and recording the temperature, conductivity, pH, etc. (as called for in the work plan). Note and record the "final" physical appearance of the water (after purging and sampling) on an appropriate field form and in the field notebook.

5.19 Wipe the well cap with a clean rag, replace the well cap and protective cover (if present). Lock the protective cover.

5.20 Verify that each sample is placed in an individual "zip-lock" bag, wrapped with "bubble wrap," placed in the cooler, and that the cooler has sufficient ice (wet ice or blue packs) to preserve the samples for transportation to the analytical laboratory.

5.21 Decontaminate bailers, hoses, and pumps as discussed in the decontamination SOP. Wrap decontaminated equipment with a suitable material (e.g., clean plastic bag or aluminum foil). Discard cords, rags, gloves, etc. in a manner consistent with site conditions.

5.22 Complete all necessary field forms, field notebook entries, and the chain-of-custody forms. Retain one copy of each chain-of-custody form. Secure the cooler with sufficient packing tape and a custody seal.

5.23 Samples collected from Monday through Friday will be delivered within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Consult the work plan to determine if any of the analytes require a shorter delivery time.

END OF PROCUDURE

APPENDIX D

Site-Specific Health and Safety Plan