408 WEST 207TH STREET
NEW YORK, NEW YORK

Remedial Action Work Plan

NYSDEC BCP Number: C231147

Prepared for:

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MAY 2022

Certifications

I, Noelle M. Clarke, P.E., certify that I am currently a NYS registered professional engineer and that this Remedial Action Work Plan 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) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

Noelle M. Clarke, P.E.	May 23, 2022	
NYS Professional Engineer #072491	Date	Signature

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

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Acronyms

µg/kg ..... Micrograms per Kilogram
µg/L ..... Micrograms per Liter
µg/m^3 ..... Micrograms per Cubic Meter
mg/kg..... Milligrams per Kilogram
4,4'-DDE..... 4,4'-Dichlorodiphenyldichloroethylene
4,4'-DDD..... 4,4-Dichlorodiphenyldichloroethane
4,4'-DDT 4,4-Dichlorodiphenyltrichloroethane
AOCs..... Areas of Concern
ASP ..... Analytical Services Protocol
AWQSGVs ..... Ambient Water Quality Standards and Guidance Values
BCA..... Brownfield Cleanup Agreement
BCP ..... Brownfield Cleanup Program
BEEI ..... Bureau of Environmental Exposure Investigation
bls..... Below Land Surface
BOA..... Brownfield Opportunity Areas
CAMP ..... Community Air Monitoring Plan
C/D ..... Construction and Demolition
CEH..... Center for Environmental Health
CFR ..... Code of Federal Regulations
COC ..... Certificate of Completion
CP-51 ..... Commissioner Policy-51
CPP ..... Citizen Participation Plan
CQAP ..... Construction Quality Assurance Plan
CSM ..... Conceptual Site Model
CVOCs ..... Chlorinated Volatile Organic Compounds
cy..... Cubic Yards
DAR..... Division of Air Resources
DCE..... cis-1,2-dichloroethene
DEC..... Department of Environmental Conservation
DER-10..... NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation
DMM..... Division of Materials Management
DO ..... Dissolved Oxygen
DUSR ..... Data Usability Summary Report
EC ..... Engineering Control
ECL ..... Environmental Conservation Law
EDD..... Electronic Data Deliverable
EJ ..... Environmental Justice
ELAP ..... Environmental Laboratory Approval Program
ESA ..... Environmental Site Assessment
FER ..... Final Engineering Report
Ft ..... Feet/Foot
HASP..... Health and Safety Plan
HAZWOPER ..... Hazardous Waste Operations and Emergency Response
Hp..... Horsepower
HVAC ..... Heating, Ventilation, and Air Conditioning

IC ..... Institutional Control
MEK ..... Methyl Ethyl Ketone; 2-butanone
MS/MSD ..... Matrix Spike/Matrix Spike Duplicate
MW ..... Monitoring Well
NG/L ..... Nanograms per Liter
NYCDEP ..... New York City Department of Environmental Protection
NYCDOT ..... New York City Department of Traffic
NYCRR ..... New York Codes, Rules, and Regulations
NYSDEC ..... New York State Department of Environmental Conservation
NYSDOH ..... New York State Department of Health
NYSDOT ..... New York State Department of Transportation
O&M ..... Operation and Maintenance
ORP ..... Oxidation-Reduction Potential
OSHA ..... Occupational Safety and Health Administration
PAHs ..... Polycyclic Aromatic Hydrocarbons
PCBs ..... Polychlorinated Biphenyls
PCE ..... Tetrachloroethene (Perchloroethene)
PEJA ..... Potential Environmental Justice Area
PDF ..... Portable Document Format
PID ..... Photo Ionization Detector
PPE ..... Personal Protective Equipment
PVC ..... Polyvinyl Chloride
QAPP ..... Quality Assurance Project Plan
QA/QC ..... Quality Assurance/Quality Control
RAOs ..... Remedial Action Objectives
RAWP ..... Remedial Action Work Plan
RI ..... Remedial Investigation
RIR ..... Remedial Investigation Report
SCG ..... Standards, Criteria, and Guidance
SCOs ..... Soil Cleanup Objectives
SEQRA ..... State Environmental Quality Review Act
SMP ..... Site Management Plan
SOE ..... Support of Excavation
SoMP ..... Soil Management Plan
SOP ..... Site Operations Plan
SSO ..... Site Safety Officer
SVOC ..... Semivolatile Organic Compounds
SWPPP ..... Stormwater Pollution Prevention Plan
TAGM ..... Technical and Administrative Memorandum
TAL ..... Target Analyte List
TCE ..... Trichloroethene
TCL ..... Target Compound List
TCLP ..... Toxicity Characteristics Leaching Procedure
TOGS ..... Technical and Operational Guidance Series
USEPA ..... United States Environmental Protection Agency
USGS ..... United States Geological Survey
VOC ..... Volatile Organic Compounds

Executive Summary

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of Harlem River Ninth Avenue Development LLC (the Volunteer), has prepared this Remedial Action Work Plan (RAWP) for the for the 408 West 207th Street redevelopment project (Site). The Site was investigated and will be remediated under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). 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, 9th Avenue, beyond which is a commercial use building and the Harlem River, to the east, and a parking lot and former grocery store (BCP Site # 231144) beyond which are residential and commercial use buildings to the west. (**Figure 1**).

The Site address is 408 West 207th Street, New York, New York, occupying Tax Lot 21 of Tax Block 2203 and encompassing 0.460 acres (approximately 20,038 square feet). As shown on **Figure 2**, the Site is an asphalt parking lot.

The anticipated redevelopment for the Site is affordable and market rate multifamily housing with ground level retail/commercial spaces, community facility space and parking. The Site building will contain a cellar across the majority of the footprint, except a small section on the western end of the building.

The Volunteer executed a Brownfield Cleanup Agreement (BCA) with NYSDEC on August 17, 2021 and the site number assigned to the Site is C231147.

A Track 1 remedy and application of Unrestricted Use Soil Cleanup Objectives (UUSCOs) as defined in 6 New York Codes, Rules, and Regulations (6NYCRR) Part 375-6-8(b) Environmental Remediation Programs are proposed for the Site.

The Remedial Investigation Report (RIR), submitted under separate cover and concurrently with this RAWP, summarizes the findings of the following reports and investigations: June 2019 Remedial Investigation Report prepared by Roux; January/February 2021 BCP Eligibility Soil Sampling performed by Roux; and November 2021 Remedial Investigation (RI) conducted by Roux; and November 2021 *In Situ* Waste Characterization conducted by Roux. Sections 2 through 6 of this RAWP are identical to those same sections in the RIR, except that several of the appendices are not included in this RAWP and can be found in the RIR to limit the file size.

The Remedial Investigation (RI), detailed in the RIR and this RAWP determined the nature and extent of contamination at the Site, characterized environmental media, qualitatively assessed the potential exposure of receptors to Site contaminants, and developed any other additional data necessary to support the development of a RAWP. The RI for this Site did not identify fish and wildlife resources.

Unrestricted use as defined in 6NYCRR Part 375-6 Environmental Remediation Programs is proposed for the Site. Currently, the Site contains an asphalt-paved parking lot and is located in an area zoned as Residential and Commercial.

All work summarized in the RIR was completed in accordance with the NYSDEC-approved Remedial Investigation Work Plan (RIWP) for the Site, the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, May 2010), and/or the New York State Department of Health's

(NYSDOH's) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006 and Revised 2017 (NYSDOH Guidance).

This RAWP provides an evaluation of a Track 1 cleanup and a Track 2 (Restricted Residential) Remedial Action alternative, their associated costs, and the recommended and preferred remedy: Track 1 Unrestricted Use. The remedy described in this document is consistent with the procedures defined in DER-10 and complies with all applicable standards, criteria, and guidance. The remedy described in this document also complies with all applicable Federal, State, and local laws, regulations, and requirements.

Significant Threat

The NYSDEC and NYSDOH have not yet determined if the Site poses a significant threat to human health and the environment.

Site Description/Physical Setting

A Site location map is included as **Figure 1**.

Property Location	
Site Name:	408 West 207th Street
Property Address:	408 West 207th Street, New York, NY
Property Town, County, State:	Manhattan, New York, New York
Property Tax Identification:	Tax Block 2203, Lot 21
Property Topographic Quadrangle:	USGS – Central Park Quadrangle
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, 9th Avenue, beyond which is a commercial use building and the Harlem River, to the east, and a parking lot and former grocery store (BCP Site # 231144) beyond which are residential and commercial use buildings to the west.

Property Information	
Property Acreage:	0.460 acres
Property Shape:	Rectangular
Property Use:	Former gasoline filling station in the northeastern portion of the Site from 1947 to 1968 and former automobile garage in the southeastern portion of the Site. Since 1969, the Site has been used as an asphalt parking lot.
Improvements:	None

Summary of Proposed Redevelopment Plan

The development proposal plan includes the construction of a new residential building covering the entire footprint of the Site. This building will be part of New York City Housing Preservation and Development (NYC HPD) sponsored affordable housing programs. Residential amenities will include community rooms,

laundry facilities, a fitness center, a theater, and other spaces as directed by the client. Parking to meet residential and retail parking requirements will be provided at grade and in the cellar. The cellar will also contain retail storage, utility service rooms, and residential back of house.

Summary of Environmental Findings

The following is a summary of the geological and hydrogeological findings, and the soil, groundwater, and soil vapor quality data that were generated by Roux during the RI (which collectively includes the 2021 RI, the 2021 waste characterization samples and all Roux data collected previously).

Local Geology and Stratigraphy

The Site is underlain by fill (consisting of sand, gravel, brick, concrete, and glass) to depths ranging from 4 to 9.5 feet below land surface. Fill materials overlie native fine to coarse sand with some gravel and silt. Dark brown to grey organic-rich silt and clay lenses were observed at several locations at depths of approximately 13 to 15 and 17 to 18 ft bls.

Site Hydrogeologic Setting

According to water-level data collected from the permanent wells on November 19, 2021, the elevation of the water table surface at the Site ranged from 3.69 ft relative to the North American Vertical Datum of 1988 (NAVD 88) at the monitoring well in the middle of the Site to 2.08 ft NAVD 88 at the monitoring well in the northeastern portion of the Site, which equates to a groundwater depth of 8.54 ft bls to 9.93 ft bls. Groundwater flow is generally to the southeast toward the Harlem River.

Soil, Groundwater and Soil Vapor Quality

- The volatile organic compounds (VOCs) detected in soil exceeding NYSDEC UUSCOs and PGWSCOs were 1,2,4-trimethylbenzene, acetone, benzene, ethylbenzene, n-butylbenzene, n-propylbenzene, and total xylenes. Only one VOC exceeded its RRSCO in one sample, which was 1,2,4-trimethylbenzene at a concentration of 82 J mg/kg. In groundwater, several VOCs, including those detected in soil above the SCOs, were detected at concentrations exceeding the NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs). Most of the VOCs exceeding PGWSCOs and the AWQSGVs are petroleum-related compounds and are located in the northeast corner of the Site. These exceedances are likely due to former gasoline filling station operations.
- SVOCs, exclusively PAHs, were detected at concentrations above NYSDEC UUSCOs, RRSCOs and PGWSCOs in the urban fill present across the Site. SVOCs were also detected in unfiltered groundwater samples above the AWQSGV in some samples. It is likely that SVOCs present in the unfiltered groundwater samples were a result of sediment present in the samples and are not representative of dissolved impacts in groundwater. This data indicates that SVOCs in soil are not a significant source of groundwater contamination at the Site.
- Metals were detected in soil at concentrations above applicable NYSDEC SCOs across the Site. Arsenic, barium, cadmium, copper, lead, mercury, nickel, and zinc were detected at concentrations above NYSDEC UUSCOs. Barium, cadmium, copper, lead, and mercury were detected at concentrations exceeding NYSDEC RRSCOs. Metals contamination is related to the presence of urban fill at the Site. Some metals were detected at concentrations above NYSDEC PGWSCOs in soil but were not detected in dissolved groundwater indicating that metals in soil are not a source of groundwater contamination at the Site. All of the metals detected above AWQSGVs in the filtered samples are naturally occurring. The exceedances of AWQSGVs for non-naturally occurring metals are likely due to sediment present in the unfiltered samples from urban fill and to not indicate metals are a source of groundwater impacts.

- PCBs were detected in three of the shallow soil sampling locations at concentrations exceeding NYSDEC UUSCOs, but none in exceedance of their RRSCOs and they were not detected in groundwater. Therefore, PCBs in soil are not a source of groundwater contamination at the Site. The PCBs detected in soil are indicative of urban fill.
- Pesticides were detected sporadically throughout shallow soils at concentrations exceeding NYSDEC UUSCOs, but none in exceedance of their RRSCOs and they were not detected in groundwater. Therefore, pesticides in soil are not a source of groundwater contamination at the Site. The pesticides detected in soil are indicative of urban fill.
- PFAS compounds were detected in groundwater. There is no documented use of PFAS at the Site and known historical Site use that would indicate the past use of these compounds. Therefore, the presence of PFAS is due to background levels of these compounds in New York City, likely due to urban fill.
- Petroleum-related and chlorinated VOCs were detected in soil vapor samples at relatively low levels across the Site. No source of low-level chlorinated VOCs was identified at the Site. The petroleum-related VOCs are likely due to the former gasoline filling station operations.

Qualitative Human Health Exposure Assessment

The following table summarizes the exposure assessment.

Environmental Media and Exposure Route	Human Exposure Assessment
Direct contact with subsurface soils (and incidental ingestion)	• Construction and remedial contractors can come into contact with soil if they complete ground intrusive work at the Site. • During remediation, remedial workers, trespassers, passersby, and utility workers could come into contact with contaminated soil contained in dust through inhalation, incidental ingestion, and dermal contact. Implementation of the HASP, CAMP and dust controls during the remedial action and any future ground intrusive activities will mitigate potential exposures.
Ingestion of groundwater	• Groundwater is not and will be not used for drinking water, as any future buildings proposed on the Site will be connected to the public water supply.
Direct contact with groundwater (and incidental ingestion)	• Remedial workers, trespassers, and utility workers could come into contact with contaminated groundwater through dermal contact and incidental ingestion during ground intrusive work. • Proper PPE and personal hygiene measures, as defined in the HASP, will be required to prevent dermal contact and the potential for incidental ingestion impacted groundwater during construction. • Future exposure to Site groundwater will be eliminated by the presence redevelopment that covers the entire Site.

Environmental Media and Exposure Route	Human Exposure Assessment
Inhalation of air (exposures related to soil vapor intrusion)	• Remedial workers, trespassers, and utility workers may be exposed to contaminated soil vapor during ground intrusive activities beneath all buildings. • Exposures to workers and passersby during the remedial action and future ground intrusive activities will be reduced or eliminated through implementation of the HASP, CAMP, and odor/vapor controls during construction. • A soil vapor intrusion evaluation will be completed based on a review of RI data, post-remedial soil end-point confirmation data and other considerations (e.g., building foundation depth below water table, use of waterproofing membrane/vapor barrier as a construction element, etc.). The evaluation will include a provision for implementing actions recommended, if necessary, to address exposures related to soil vapor intrusion.

Summary of Selected Remedial Actions

The elements of the Track 1 Unrestricted Use remedy are:

1. Installation of support of excavation (SOE) to reach the proposed remedial excavation depths to meet Track 1UUSCOs.
2. Removal of the suspected UST and any associated petroleum-impacted soil from the northeast portion of the Site.
3. Excavation and off-Site disposal of approximately 6,200 in-place cubic yards (cy) of soil (i.e., all soil exceeding UUSCOs) over the entire Site. The limits and approximate depths of remedial excavation are shown on **Figure 6**. This source removal will improve groundwater and soil vapor quality. Final remedial disposal quantities will be based on confirmation endpoint samples and actual truck weights.
4. Collection and analysis of remedial excavation bottom endpoint samples at a frequency of one per 900 square feet to document that the SCOs were met. Sidewall samples are not required.
5. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the Site, if required.
6. Dewatering, in compliance with city, state, and federal laws and regulations required to meet remedial excavation depths. Extracted groundwater will be treated on-Site under a permit from New York City Department of Environmental Protection to meet pretreatment requirements prior to discharge to the sewer system. This dewatering will improve groundwater quality and remove a source of petroleum-related soil vapor impacts.
7. As part of the Track 1 remedy, a soil vapor intrusion evaluation will be completed. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion, although based on the RI data collected and the remedial action proposed to reach Track 1 (which will remove all soil that may be a potential on-Site source of soil vapor), there will be no remaining on-Site source of vapor intrusion. In addition, the building's foundation will sit several feet below the water table, therefore there will be no soil vapor beneath the building. As such, this will preclude soil vapor sampling, which is an important component of a soil vapor intrusion evaluation (indoor air sampling alone does not provide the full picture and can be misleading). It will also preclude installation of a sub-slab mitigation system. As part of the building's design, and in line with NYSDEC green remediation principles, a full waterproofing membrane will be installed beneath the slab and up the foundation walls, which will increase the energy efficiency of the building. Considering all of these elements together, once the remedial action and building construction is complete, the potential for soil vapor intrusion will be addressed and will be documented in the Final Engineering Report.

1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of Harlem River Ninth Avenue Development LLC (the Volunteer), has prepared this Remedial Action Work Plan (RAWP) for the 408 West 207th Street redevelopment project (Site). The Site was investigated and will be remediated under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). 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, 9th Avenue, beyond which is a commercial use building and the Harlem River, to the east, and a parking lot and former grocery store (BCP Site # 231144) beyond which are residential and commercial use buildings to the west. (**Figure 1**).

The Site address is 408 West 207th Street, New York, New York, occupying Tax Lot 21 of Tax Block 2203 and encompassing 0.460 acres (approximately 20,038 square feet). As shown on **Figure 2**, Currently, the Site includes an asphalt parking lot and is located in an area zoned as Residential and Commercial.

The development proposal plan includes the construction of a new residential building covering the entire footprint of the Site. This building will be part of New York City Housing Preservation and Development (NYC HPD) sponsored affordable housing programs. Residential amenities will include community rooms, laundry facilities, a fitness center, a theater, and other spaces as directed by the client. Parking to meet residential and retail parking requirements will be provided at grade and in the cellar. The cellar will also contain retail storage, utility service rooms, and residential back of house.

The Volunteer executed a Brownfield Cleanup Agreement (BCA) with NYSDEC on August 17, 2021 and the site number assigned to the Site is C231147.

Unrestricted use as defined in 6NYCRR Part 375-6 Environmental Remediation Programs is proposed for the Site, applying the Unrestricted Use Soil Cleanup Objectives (UUSCOs) in 6NYCRR Section 375-6-8(b).

The RIR, submitted under separate cover and concurrently with this RAWP, summarizes the findings of the following reports and investigations: June 2019 Remedial Investigation Report prepared by Roux; January/February 2021 BCP Eligibility Soil Sampling performed by Roux; November 2021 Remedial Investigation (RI) conducted by Roux; and November 2021 *In Situ* Waste Characterization conducted by Roux. Sections 2 through 6 of this RAWP are identical to those same sections in the RIR, except that several of the appendices are not included in this RAWP and can be found in the RIR to limit file size.

The purpose of the RI (submitted under separate cover) was to determine the nature and extent of contamination at the Site, characterize environmental media, qualitatively assess the potential exposure of receptors to Site contaminants, and develop any other additional data necessary to support the development of a RAWP. The RI for this Site did not identify fish and wildlife resources.

All work summarized in the RIR document was completed in accordance with the NYSDEC-approved Remedial Investigation Work Plan (RIWP) for the Site, the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, May 2010), and/or the New York State Department of Health's (NYSDOH's) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006 and Revised 2017 (NYSDOH Guidance).

This RAWP provides an evaluation of a Track 1 cleanup and a Track 2 (Restricted Residential) Remedial Action alternative, their associated costs, and the recommended and preferred remedy, which is a Track 1 Unrestricted Use cleanup. The remedy described in this document is consistent with the procedures defined in DER-10 and complies with all applicable standards, criteria, and guidance. The remedy described in this document also complies with all applicable Federal, State, and local laws, regulations, and requirements.

This RAWP provides sufficient detail to implement the proposed remedy.

1.1 RAWP Organization

This RAWP contains the following sections:

- Section 2 – Describes the Site, its history, and results of previous environmental investigations;
- Section 3 – Describes the completed RI field work activities;
- Section 4 – Summarizes the RI laboratory analytical results;
- Section 5 – Provides a Conceptual Site Model (CSM) explaining the occurrence of contaminant sources and their fate and transport at the Site in the context of the local Site stratigraphy and hydrogeology;
- Section 6 – Provides a qualitative exposure assessment that evaluates exposures to contaminated media including soil, groundwater, and soil vapor;
- Section 7 – Describes the Remedial Action Objectives (RAOs) for the Site;
- Section 8 – Describes the remedial action plan for the Site;
- Section 9 – Describes the remedial action program for the Site;
- Section 10 – Describes removal of impacted material from the Site;
- Section 11 – Describes the contamination that will remain on-Site following the implementation of the remedy;
- Section 12 – Indicates that Engineering Controls are not required for the Remedy;
- Section 13 – Summarizes the Contingency Institutional Controls that will be implemented at the Site following the implementation of the remedy if Track 1 is not achieved across the Site;
- Section 14 – Describes the components of the Final Engineering Report (FER); and
- Section 15 – Summarizes the schedule for the implementation of project elements described in this RAWP.

Tables, figures, plates, and appendices are provided, which summarize all RI investigation locations, analytical data, and results of sampling efforts as well as the proposed remedial areas.

1.2 Site Location and Description

The Site address is 408 West 207th Street in the Borough of Manhattan, City and State of New York (**Figure 1**). A tax map is presented as **Figure 3**.

Additional information regarding the Site is provided in the tables below:

Property Location	
Property Name:	408 West 207th Street
Property Address:	408 West 207th Street, New York, NY
Property Town, County, State:	Manhattan, New York, New York
Property Tax Identification:	Tax Block 2203, Lot 21
Property Topographic Quadrangle:	USGS – Central Park Quadrangle
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, 9th Avenue, beyond which is a commercial use building and the Harlem River, to the east, and a parking lot and former grocery store (BCP Site # 231144) beyond which are residential and commercial use buildings to the west.

Property Information	
Property Acreage:	0.460 acres
Property Shape:	Rectangular
Property Use:	Former gasoline filling station in the northeastern portion of the Site from 1947 to 1968 and former automobile garage in the southeastern portion of the Site. Since 1969, the Site has been used as an asphalt parking lot.
Improvements:	None

1.3 Contemplated Redevelopment Plan

The development proposal plan includes the construction of a new residential building covering the entire footprint of the Site. This building will be part of New York City Housing Preservation and Development (NYC HPD) sponsored affordable housing programs. Residential amenities will include community rooms, laundry facilities, a fitness center, a theater, and other spaces as directed by the client. Parking to meet residential and retail parking requirements will be provided at grade and in the cellar. The cellar will also contain retail storage, utility service rooms, and residential back of house.

1.4 Description of Surrounding Property

The area surrounding the Site is an urban area comprised primarily of commercial and multi-family residential properties (**Figure 4**). The Site (Block 2203, Lot 21) is adjoined by the following: West 207th Street and the 207th Street Train Yard Facility and a gasoline station across the street to the north, West 206th Street to the south, a 9th Avenue, beyond which is a commercial use building and the Harlem River to the east, and a parking lot and former grocery store (BCP Site #221144), beyond which are residential and commercial use buildings to the west.

A figure presenting the land use is provided as **Figure 4**.

2. Background

The following sections provide pertinent background information, including the documented history of the Site, and the results of previous environmental investigation work conducted at the Site. As noted previously, the text of this section is identical to Section 2 in the RIR.

2.1 Historic Land Uses

Based on the review of Historic Sanborn fire insurance maps, aerial photographs, topographic maps, city directories, and New York City Assessor's and Building Department records presented in the October 7, 2010 Phase I Environmental Site Assessment (ESA) prepared by EBI, the following Site history was established. From approximately 1896 through 1925, Block 2203, Lot 21 (Site) and the surrounding area existed as undeveloped land. The southern portion of the Site was developed in 1926 with an automobile garage and operated from 1926 through 1968. From 1947 to 1968, a gasoline filling station was located in the northern area of the Site. According to historic records reviewed by EBI Consulting as part of a Phase I ESA, the former operations are suspected to have included the on-site storage and use of petroleum products, automotive fluids, battery acids, solvents, and/or other hazardous materials. By 1969, all structures were demolished and the paved parking lot was completed and remains present today. The Site is currently owned by Harlem River Ninth Avenue Development LLC.

2.2 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 gently to the southeast toward the Harlem River. The elevation of the Site ranges from approximately 13 to 11 feet referenced to North American Vertical Datum of 1988 (NAVD 88) from the northwest to southeast portions of the Site, respectively.

2.3 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, a small portion of the Site is within the 500-year flood zone. The nearest natural surface water body is the Harlem River, located approximately 500 feet to the east.

2.4 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, tile, and glass) to depths ranging from 4 to 9.5 feet below land surface (ft bls). Fill materials overlie native fine to coarse sand with some gravel and silt. A layer of peat was observed from 14 to 15 ft bls at location RX-26 completed by Roux in the northern area of the Site. Bedrock was encountered between 50 and 80 ft bls during the geotechnical investigation performed in conjunction with Roux's 2018 subsurface investigation. Bedrock slopes downward toward the east.

2.5 Hydrogeology

During the RI, groundwater was encountered between 8.5 and 10 ft bls. Under natural, undisturbed conditions, shallow groundwater flow generally follows the topography of the land surface. Based on the surrounding topography, and the data generated during the RI, the groundwater flow in the vicinity of the Site

is in an east-southeasterly direction towards the Harlem River, located approximately 500 feet to the east of the Site. Groundwater flow direction is likely influenced by subsurface utilities, lithology, and other subsurface features.

2.6 Historic Environmental Reports

This section provides an overview of previous environmental-related activities completed at the Site, based on a review of readily available information and the following environmental reports (included in **Appendix B** of the RIR). The following environmental reports were available for review:

- **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 B** of the RIR.

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

Several recognized environmental conditions (RECs) were identified in the EBI Phase I ESA. The portion of the Phase I ESA relating to Lot 21 is discussed below. The RECs are summarized as follows:

RECs

- The potential presence of fill material is a REC for Lot 21. 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.
- According to historic records reviewed by EBI, a gasoline station occupied the northern portion of Lot 21 from 1947 until 1968 and an auto garage occupied the southern portion of Lot 21 from 1926 until 1968. The former operations are suspected to have included the on-site storage and use of petroleum products, automotive fluids, battery acids, solvents, and/or other hazardous materials. No additional documentation regarding closure of the former underground storage tank (UST) systems, or documentation regarding previous soil and/or groundwater investigation in this area, was identified during the ESA. Based upon the absence of closure documentation, the potential exists that the former UST systems and historical use have impacted subsurface conditions for Lot 21. This is considered a REC.

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

Stantec performed a Phase II ESA in December 2011. The portion of the Phase II ESA relating to Lot 21 is discussed below. A summary of findings is provided below:

Soil/Fill

According to the Stantec Phase II ESA, photoionization detector (PID) field screening results for soil samples collected from borings indicated the presence of VOCs at concentrations elevated above background. Measured PID concentrations in the top four to five feet of overburden material were 0.0 to 187 ppmv at

B-102, and 20.3 ppmv at B-103. PID readings in the soil samples collected from 5 to 16 ft bls ranged from 462 to 858 ppmv at B-102 and from 72 to 1,275 ppmv at B-103. VOC, SVOC, and metals exceedances of NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and NYSDEC Part 375 Restricted Residential Soil Cleanup Objectives (RRSCOs) within the boundaries of the Site are depicted on **Plate 1**.

Groundwater

According to the Stantec Phase II ESA, VOCs including 1,2,4-trimethylbenzene (at 172 micrograms per liter [µg/L] within B-102), 1,3,5-trimethylbenzene (at 51.3 µg/L within B-102), 4-isopropylbenzene (at 10 µg/L within B-102), benzene (max. of 10.7 µg/L at B-103), ethylbenzene (max. of 46.6 µg/L within B-102), isopropylbenzene (max. of 129 µg/L at B-102), m+p-xylene (max. of 10.5 µg/L within B-102), naphthalene (max. of 182 µg/L within B-103), n-butylbenzene (max. of 56.1 µg/L within B-103), n-propylbenzene (max. of 383 µg/L within B-103), sec-butylbenzene (at 24.2 µg/L within B-103), and tert-butylbenzene (at 30.3 µg/L within B-103), were detected above their Ambient Water Quality Standards and Guidance Values (AWQSGVs). Naphthalene was the only SVOC detected above AWQSGVs (at 52.6 µg/L at B-102 and B-103). Metals analyzed in groundwater did not exceed NYSDEC AWQSGVs. Groundwater sample locations within the boundaries of the Site are depicted on **Plate 2**.

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 portion of the RIR relating to Lot 21 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 UUSCOs and RRSCOs:

VOCs

- Benzene, ethylbenzene, n-butylbenzene, n-propylbenzene, 1,2,4-trimethylbenzene, and xylenes exceeded the UUSCOs. Of these VOCs, 1,2,4-trimethylbenzene also exceeded the RRSCO.

Metals

- Arsenic, copper, lead, mercury, and zinc exceeded the UUSCOs. Of these metals, arsenic, copper, and mercury also exceeded the RRSCOs.

Exceedances of RRSCOs and UUSCOs within the boundaries of the Site are depicted on **Plate 1**.

Groundwater

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

VOCs

- Benzene, ethylbenzene, isopropylbenzene, m+p-xylene, toluene, and chloroform.

SVOCs

- Naphthalene.

Metals (total)

- Iron, lead, magnesium, manganese, selenium, and sodium.

Exceedances of AWQSGVs within the boundaries of the Site are depicted on **Plate 2**.

Soil Vapor

Soil vapor samples collected showed significant 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

- 1,1,1-trichloroethane, 1,3-butadiene, 2-butanone, n-hexane, benzene, butane, carbon disulfide, chloroform, cyclohexane, isopropylbenzene, n-heptane, n-propylbenzene, m+p-xylene, isooctane, styrene, tetrachloroethene (PCE), and toluene.

Detections of analytes in soil vapor within the boundaries of the Site are depicted on **Plate 3**. 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 Spill

Spill number 1902616 was assigned to the Site on June 12, 2019 after the NYCOER reviewed the Site data from 2011 and identified one soil boring (B-102) with evidence of petroleum contamination. Spill remediation will be addressed by this RAWP.

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

Roux performed a subsurface soil investigation in January 2021. Four soil borings (RX-26 through RX-29) were advanced during the investigation of the Site. Similar to previous investigations, groundwater was encountered between 7 and 10 feet below ft bls. Subsurface materials generally contained fill materials (consisting of sand, gravel, brick, concrete, tile, and glass), to depths ranging from 5 to 9.5 feet ft bls. Fill materials overlie native fine to coarse sand with some gravel and silt. A layer of peat was observed from 14 to 15 ft bls at location RX-26.

A total of 10 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 polychlorinated biphenyls (PCBs). A summary of findings of detected compounds and comparison to NYSDEC Part 375 UUSCOS and RRSCOs for soil is provided below:

Soil Results

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

SVOCs:

- Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene exceeded the UUSCOs. Of these SVOCs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene exceeded the RRSCOs.

Metals:

- Arsenic, barium, cadmium, copper, lead, mercury, and zinc exceeded the UUSCOs. Of these metals, barium and mercury exceeded the RRSCOs.

Exceedances of the RRSCOs and UUSCOs within the boundaries of the proposed Site are graphically depicted on **Plate 1.**

2.6.1 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 in soil and groundwater, polycyclic aromatic hydrocarbons (PAHs) and metals in soil, 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 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 14**, **Plates 1 through 3**, and the sample locations are also shown on **Figure 2**.

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 UUSCOs, and NYSDEC RRSCOs. The investigations revealed elevated concentrations of VOCs, PAHs, and metals in soil. More information on soil exceedances is provided below:

- VOCs including benzene (maximum of 0.45 mg/kg), n-butylbenzene (maximum 59.1 mg/kg), sec-butylbenzene (maximum 20.7 mg/kg), ethylbenzene (maximum of 15.4 mg/kg), naphthalene (maximum 140 mg/kg), n-propylbenzene (maximum 111 mg/kg), 1,2,4-trimethylbenzene (maximum 184 mg/kg), 1,3,5-trimethylbenzene (maximum 60.5 mg/kg), and xylenes (maximum of 2.7 mg/kg) were detected above their UUSCOs. Of these VOCs, naphthalene, n-propylbenzene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene were detected above their respective RRSCOs predominantly in one sample at a depth of 6.5 to 7 ft bls.
- Several SVOCs, consisting of PAHs including benzo(a)anthracene (maximum 1.5 mg/kg), benzo(a)pyrene (maximum 1.5 mg/kg), benzo(b)fluoranthene (maximum 2 mg/kg), chrysene (1.3 mg/kg), indeno(1,2,3-c,d)pyrene (maximum 0.83 mg/kg), and naphthalene (maximum 56.3 mg/kg) were detected above their respective UUSCOs predominantly in intervals of fill on Site at depths ranging between 5 to 7 ft bls. Of these SVOCs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene were also present at concentrations above their RRSCOs.
- Metals including arsenic (maximum 46.2 mg/kg), barium (maximum 532 mg/kg), cadmium (maximum 3.3 mg/kg), chromium (maximum 37.1 mg/kg), copper (maximum 473 mg/kg), lead (maximum 307 mg/kg), mercury (maximum 6.4 mg/kg), and zinc (maximum 898 mg/kg) were detected above their UUSCOs. Of these metals, arsenic, barium, copper, and mercury were also present at concentrations above their RRSCOs.
- Total PCBs were detected above their UUSCOs with a maximum concentration of 0.39 mg/kg.
- Pesticides were not detected above their UUSCOs or RRSCOs.

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 (maximum 54 µg/L), n-butylbenzene (maximum 56.1 µg/L), tert-butylbenzene (maximum 30.3 µg/L), sec-butylbenzene (maximum 24.2 µg/L), chloroform (maximum 8.2 µg/L), ethylbenzene (maximum 46.6 µg/L), isopropylbenzene (maximum 280 µg/L), 4-isopropylbenzene (maximum 10 µg/L), naphthalene (maximum 182 E µg/L), n-propylbenzene (maximum 383 µg/L), toluene (maximum 5.5 µg/L), m+p-xylene (maximum 10.5 µg/L), 1,2,4-

trimethylbenzene (maximum 172 E µg/L), and 1,3,5-trimethylbenzene (maximum 51.3 µg/L) were detected above their AWQSGVs.

- One SVOC, naphthalene (maximum 90 µg/L) was detected above its AWQSGV.
- Total metals including iron (maximum 19,400 µg/L), lead (maximum 209 µg/L), magnesium (maximum 46,900 µg/L), manganese (maximum 726 µg/L), selenium (maximum 11.7 µg/L), and sodium (maximum 615,000 µg/L) were detected above their AWQSGVs. The groundwater samples were collected from temporary monitoring wells and were not filtered. It is likely the detected metals are primarily due to suspended sediments present in the groundwater samples. 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 the soil vapor samples across the Site and were below mitigate action levels.

Matrix A Compounds: carbon tetrachloride, cis-1,2-dichloroethene, 1,1-dichloroethene, TCE

- Carbon tetrachloride, cis-1,2-dichloroethene, 1,1- dichloroethene, and TCE were not detected in soil vapor.

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

- PCE was detected at V-5 at a concentration of 26 µg/m^3.
- 1,1,1-Trichloroethane was detected at V-5 at a concentration of 6.0 (estimated) µg/m^3.
- Methylene chloride was not detected in soil vapor.

Matrix C Compound: vinyl chloride:

Vinyl chloride was not detected in soil vapor.

3. 2021 Remedial Investigation Field Activities

The following sections summarize the work completed by Roux and its subcontractors during the 2021 RI. The SOW was completed in accordance with the RIWP approved on November 3, 2021, and associated project plans including the Health and Safety Plan (HASP), Quality Assurance Project Plan (QAPP)/Field Sampling Plan (FSP) and Community Air Monitoring Plan (CAMP). Deviations from the RIWP, including scope modifications, are noted in Section 3.10. All work was performed in accordance with NYSDEC DER-10 and the NYSDOH Guidance. As noted previously, the text of this section is identical to Section 3 in the RAWP.

Based on the findings of the prior investigations, the following preliminary Areas of Concern (AOCs) that were investigated during the 2021 RI included:

- Presence of contaminated soil, groundwater and potentially soil vapor;
- Presence of soil and groundwater impacts due to the former gasoline filling station in the northern portion of the Site; and
- Potential migration of contaminants of concern onto the Site in groundwater and soil vapor from surrounding properties.

The scope of the 2021 RI included the collection of enough Site characterization data so that, together with the historical data, the entire Site would be sufficiently characterized to support the development of the RAWP. Data collected during the 2021 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 was 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 2021 RI samples; however, since NYSDEC ASP Category B reports were not published in the 2011 Stantec Phase II ESA, this data is not included in the DUSR submitted as part of the RIR prepared for the Site.

3.1 Objectives

Based on the existing data for the Site and AOCs identified above, the following objectives were identified:

- 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 2021 RI evaluates 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 2021 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 the RAWP.

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

- After the removal of any obstructions, 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 data was produced in accordance with NYSDEC Analytical Services Protocol (ASP) Category B deliverables and was reviewed and validated by Laboratory Data Consultants, Inc., a party independent of the project team, in a DUSR before being incorporated into the RIR for the Site. All data was submitted to NYSDEC in electronic format, in accordance with DER-10, Section 1.15.

The overall scope of each component of the 2021 RI is discussed in the following subsections. Detailed field sampling procedures were provided in the QAPP/FSP (Appendix C of the RIWP). The sampling locations are shown on Figure 2 and additional information, including intervals sampled and sample rationale, is provided below.

3.2 Site Reconnaissance

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

3.3 Soil Investigation

Soil samples were collected for the Remedial Investigation and also for *in situ* pre-characterization of soil for waste disposal. Boreholes were 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). If a utility or other feature was observed during pre-clearance activities, the sampling location was relocated as close as possible to the original location. Soil samples were collected by hand or by utilizing a GeoProbe® Direct-Push Drill Rig. Soil was collected continuously from land surface to the bottom of the boring. During installation of the soil borings, the lithology was recorded in accordance with the Unified Soils Classification System (USCS), and soil was 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.

The sampling methodology for each type of sampling is discussed in the following subsections.

3.3.1 Remedial Investigation Soil Sampling

To further characterize the soil conditions and to delineate known contamination at the Site, a total of nine soil borings were completed once the current Site operator vacated the property. The sample locations are shown in **Figure 2** and discussed below. Downgradient samples were used for the purpose of assisting with the QHHEA.

The sample intervals selected for laboratory analysis varied at each boring location to allow for the vertical delineation of soil impacts beginning in the fill layer and continuing into native soils beneath the overlying fill layer. Shallow and intermediate depth soil samples were completed as shown on the table below to provide vertical delineation of contamination at the Site.

The general approach to soil sampling was to achieve vertical delineation by identifying the interface between overlying fill material (identified by soil intermixed with materials such as brick, concrete, and/or glass) and deeper native soils and sampling surrounding this interface with the following samples:

- Two-foot interval immediately below current grade only in areas of the Site not previously investigated;
- Two-foot interval directly above the fill/native soil interface (in the fill);
- Two-foot interval directly below the fill/native soil interface (0-2 ft below fill/native soil interface in the native soil);
- Deeper two-foot interval of native soil (2-4 ft below fill/native soil interface);
- Two-foot interval beneath the planned excavation depth to be held pending analysis of the deeper native sample; and
- One additional soil sample collected from each borehole if odor/visual evidence of contamination or elevated PID measurements were observed.

Actual sampling depths were determined by the field personnel based on observable lithology during drilling. The table below shows the actual samples that were collected from each soil boring and those that were analyzed using a phased approach, as supported by the sampling rationale provided below and described in more detail in the QAPP/FSP.

Nine soil borings were advanced to characterize soil conditions in the following locations at the Site and sampled at the depths indicated:

Location	Planned Sample Depth Intervals (in ft bls unless otherwise noted)	Actual Sample Depth Interval Analyzed (ft bls)
SB-21-01	Deepest 2 ft fill interval 0-2 ft below fill/native soil interface 2-4 ft below fill/native soil interface 13-15 (Hold)	2-4 (extra sample, odor observed) 4-6 6-8 10-12 13-15 15-17 (extra sample, odor observed)
SB-21-02	Deepest 2 ft fill interval 0-2 ft below fill/native soil interface 2-4 ft below fill/native soil interface 12.5-14.5 (Hold)	4-6 6-8 8-10
SB-21-03	0-2 ft bls Deepest 2 ft fill interval 0-2 ft below fill/native soil interface 2-4 ft below fill/native soil interface 13-15 (Hold)	0-2 3-5 5-7 7-9
SB-21-04	0-2 ft bls Deepest 2 ft fill interval 0-2 ft below fill/native soil interface 2-4 ft below fill/native soil interface 13.5-15.5 (Hold)	0-2 4-6 6-8 8-10

Location	Planned Sample Depth Intervals (in ft bls unless otherwise noted)	Actual Sample Depth Interval Analyzed (ft bls)
SB-21-05	Deepest 2 ft fill interval 0-2 ft below fill/native soil interface 2-4 ft below fill/native soil interface 14.5-16.5 (Hold)	4-6 6-8 8-10
SB-21-06	0-2 ft bls Deepest 2 ft fill interval 0-2 ft below fill/native soil interface 2-4 ft below fill/native soil interface 12.5-14.5 (Hold)	0-2 2-4 4-6 6-8
SB-21-07	0-2 ft bls Deepest 2 ft fill interval 0-2 ft below fill/native soil interface 2-4 ft below fill/native soil interface 14-16 (Hold)	0-2 2-4 4-6 6-8
SB-21-08	0-2 ft bls Deepest 2 ft fill interval 0-2 ft below fill/native soil interface 2-4 ft below fill/native soil interface 13-15 (Hold)	0-2 3-5 5-7 7-9
SB-21-09	0-2 ft bls Deepest 2 ft fill interval 0-2 ft below fill/native soil interface 2-4 ft below fill/native soil interface 13.5-15.5 (Hold)	0-2 4-6 6-8 8-10

Following sample collection, boreholes that were not converted to monitoring wells or soil vapor sample points were 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. Soil from borings converted to monitoring wells was 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 were surveyed by a licensed New York State surveyor to obtain horizontal and vertical coordinates.

3.3.2 *In Situ* Waste Characterization Soil Sampling

To supplement the soil samples collected for the remedial investigation, 18 soil samples were collected as *in situ* waste characterization samples. Roux divided the Site into a three-dimensional grid based on the provided topographic survey by Control Point Associates, Inc. dated June 12, 2018, and an assumed bottom depth of excavation of -1.5 ft NAVD88. A target sampling frequency of one sample per 900 CY was selected and grid dimensions were approximately 57.5 ft by 70 ft by a maximum of 6 ft deep. The waste characterization samples were collected from six of the soil borings advanced during the RI across Site. The boring identifications, sample depths, and corresponding elevations are included in the table below.

Waste Characterization Boring Identification	RI Boring Identification	Sample Elevation (NAVD88)	Sample Depth (ft bls)
F1	SB-21-05	+13.5 to +9	0 to 4.5
		+9 to +3	4.5 to 10.5
		+3 to -3	10.5 to 16.5

Waste Characterization Boring Identification	RI Boring Identification	Sample Elevation (NAVD88)	Sample Depth (ft bls)
F2	SB-21-07	+13 to +9	0 to 4
		+9 to +3	4 to 10
		+3 to -3	10 to 16
F3	SB-21-04	+12.5 to +9	0 to 3.5
		+9 to +3	3.5 to 9.5
		+3 to -3	9.5 to 15.5
G1	SB-21-01	+12 to +9	0 to 3
		+9 to +3	3 to 9
		+3 to -3	9 to 15
G2	None	+12 to +9	0 to 3
		+9 to +3	3 to 9
		+3 to -3	9 to 15
G3	SB-21-02	+11.5 to +9	0 to 2.5
		+9 to +3	2.5 to 8.5
		+3 to -3	8.5 to 14.5

During screening and sampling, VOC samples collected for laboratory analysis were selected from the two-foot interval of each grid exhibiting the most evidence of contamination based on visual inspection and field screening procedures outlined above. If no evidence of contamination was observed, the VOC samples for each location were collected from the first two-foot horizon of each sampling location (e.g., 0-2 ft bls, 6-8 ft bls). All VOC samples were collected as grabs using EnCore® or Core-n-One® samplers. Upon completion of each boring to the specified sample depth interval, one composite sample of the soil from the entire grid was submitted for laboratory analyses.

3.4 Groundwater Investigation

Three permanent groundwater monitoring wells (MW-21-01 through MW-21-03) were installed at co-located soil boring locations as discussed in the embedded table in Section 3.3.1. The groundwater monitoring well locations are shown on **Figure 2**. 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 were provided in the QAPP/FSP in Appendix C of the RIWP.

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

Following well development, each monitoring well was purged consistent with USEPA low-flow sampling requirements, and one round of groundwater samples was 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.) were collected using a water quality meter during purging and prior to sampling. Additional details on sampling procedure were provided in the QAPP/FSP in Appendix C of the RIWP.

3.5 Soil Vapor Investigation

In addition to the two previous soil vapor samples discussed in Section 2.6, four new soil vapor samples were collected during the RI. Soil vapor points SV-21-01, SV-21-04, SV-21-05 and SV-21-06 were installed at co-located soil boring locations as discussed in the embedded table in Section 3.3.1.

The soil vapor samples were collected from temporary soil vapor points installed by hand approximately two feet above the water table. New Teflon®-lined polyethylene tubing was attached to a 6-inch stainless steel sample screen. The soil vapor points were backfilled with #2 Morie sand to approximately one foot above the screen. The remainder of the borehole was backfilled with a concrete/bentonite slurry to grade.

The soil vapor samples were 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 was 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 soil vapor sampling locations are shown on **Figure 2**. Additional details regarding soil vapor sampling methods were provided in the QAPP/FSP in Appendix C of the RIWP.

3.6 Laboratory Analysis

Soil and groundwater samples collected from the soil investigation were analyzed for the full Target Compound List (TCL)/Part 375 list VOCs and SVOCs + 30 (10 VOCs and 20 SVOCs) highest concentration tentatively identified compounds (TICs), Target Analyte List (TAL)/Part 375 list metals (including hexavalent chromium and total cyanide), TCL/Part 375 list pesticides, TCL/Part 375 list herbicides, TCL PCBs, 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 were analyzed for total and dissolved TAL metals and SVOCs.

All soil vapor air samples were analyzed using USEPA Method TO-15 for VOCs. All samples were analyzed at a NYSDOH Environmental Laboratory Approval Program-certified (ELAP) laboratory. Additional details regarding laboratory analyses are included in the QAPP/FSP (Appendix C) of the RIWP.

All 2021 RI data was produced in accordance with NYSDEC ASP Category B deliverables and was reviewed and validated by Laboratory Data Consultants, Inc, who prepared a DUSR before being incorporated into the RIR for the Site and this RAWP. All data was submitted to NYSDEC in electronic format, in accordance with DER-10, Section 1.15.

3.7 Surveying Assessment

All newly installed monitoring wells, soil borings, and soil vapor points were surveyed by a New York Licensed Surveyor to obtain horizontal and vertical coordinates and grade elevations. Measuring point elevations from newly installed monitoring wells were surveyed to enable groundwater flow contouring. Horizontal coordinates were based upon New York State Plane Coordinate System, Long Island Zone,

North American Datum of 1983 (NAD 83) in US Survey Feet. Vertical elevations measured for top-of-casing (measuring point) and grade elevations were referenced to North American Vertical Datum of 1988 (NAVD 88).

3.8 Investigation Derived Waste Disposal

All wastes generated during the 2021 RI will be handled, transported, and disposed of in a manner consistent with Federal, State, and local laws and regulations.

3.9 Community Air Monitoring Program

Roux implemented a CAMP during the entire subsurface investigation to prevent off-Site migration of VOCs and particulates and protect potential off-Site receptors. CAMP was conducted from November 9, 2021 to November 12, 2021 when intrusive activities were occurring outdoors and when weather permitted. CAMP could not be implemented on November 12, 2021 due to inclement weather. The CAMP included the use of two air monitoring stations (one upwind and one downwind), each equipped with one PID and one particulate meter. No exceedances of VOCs or particulates were observed, and there were no required actions taken to mitigate dust or VOC levels at the Site.

3.10 Summary of Deviations from the RIWP

The following section discusses deviations from the RIWP.

Data Validation

Laboratory Data Consultants, Inc., was the data validator instead of Joshua Cope of Roux Associates, Inc.

Environmental Sampling Locations and Depths

Final locations of soil borings, monitoring wells, and soil vapor points were based on the locations proposed in the RIWP; however, the final locations were adjusted based on conditions encountered during the subsurface investigation and are shown on **Figure 2**. Boring locations SB-21-01, SB-21-04, SB-21-06, and SB-21-09 were moved slightly due to obstructions encountered during hand clearing.

4. Remedial Investigation Results

The following section provides a summary of the geological and hydrogeological findings, and the soil, groundwater, and soil vapor quality data that were generated by Roux during the RI (which collectively includes the 2021 RI, the 2021 waste characterization samples and all Roux data collected previously). Data tables with all the data generated during the RI are provided in Tables 1 through 14. Soil, groundwater, and soil vapor analytical data are provided as Plates 1 through Plate 3. As noted previously, the text of this section is identical to Section 4 in the RAWP.

4.1 Geological and Hydrogeological Conditions

The following sections provide a description of the geological and hydrogeological findings of the Site as determined by performance of the RI. A hydrogeologic investigation was conducted in an effort to evaluate the subsurface conditions that could influence the nature and extent, possible migration, and remediation of contamination at the Site.

4.1.1 Local Geology and Stratigraphy

The Site is underlain by fill (consisting of sand, gravel, brick, concrete, tile and glass) to depths ranging from 4 to 9.5 ft bls. Fill materials overlie native fine to coarse sand with some gravel and silt. Dark bbrown to grey organic-rich silt and clay lenses were observed at several locations at depths of approximately 13 to 15 and 17 to 18 ft bls. Soil boring logs are provided in Appendix B.

4.1.2 Site Hydrogeologic Setting

According to water-level data collected from the permanent wells on November 19, 2021, the elevation of the water table surface at the Site ranged from 3.69 ft NAVD 88 at the monitoring well in the middle of the Site to 2.08 ft NAVD 88 at the monitoring well in the northeastern portion of the Site, which equates to a groundwater depth of 8.54 ft bls to 9.93 ft bls. To provide additional data points to determine the groundwater flow direction, monitoring wells from adjacent BCP Site C231144 were also incorporated into the flow map. Groundwater gauging data is included as **Table 1**. A groundwater flow map is provided in **Figure 5** and it shows that the flow is generally to the southeast toward the Harlem River.

4.2 Remedial Investigation Sample Results

The following sections summarize soil, groundwater, and soil vapor quality data that was generated by Roux during the RI (comprised of the 2021 RI and all previous Roux investigations). Data tables showing the sample data generated during these events are provided in **Tables 2 through 14**.

4.2.1 Soil Quality

A total of 78 soil samples and 5 field duplicate soil samples were collected and analyzed from 21 soil boring locations and submitted for laboratory analysis. Site-wide analytical soil data was compared to the following NYSDEC Subpart 375-6 SCOs as noted in the RIWP in order to evaluate Site-wide soil quality and to determine contamination in soil, if present:

- NYSDEC UUSCOs;
- NYSDEC RRSCOs; and
- NYSDEC PGWSCOs.

Laboratory analytical data generated for soil is summarized in Tables 2 through 7. Soil boring locations with soil sample exceedances of the NYSDEC Subpart 375-6 SCOs are shown on **Plate 1**.

A summary of soil quality results is provided in the below sections.

4.2.1.1 Volatile Organic Compounds in Soil

A summary of the VOC exceedances in the soil samples analyzed is provided below:

VOC Exceedances of SCOs in Soil

Analyte	NYSDEC UUSCO (mg/kg)	Detections above NYSDEC UUSCOs	NYSDEC RRSCOs (mg/kg)	Detections above NYSDEC RRSCOs	NYSDEC PGWSCOs (mg/kg)	Detections above NYSDEC PGWSCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
1,2,4-Trimethylbenzene	3.6	1	52	1	3.6	1	82 J	RX-1 (8-10)
Acetone	0.05	1	100	-	0.05	1	0.08	SB-21-06 (4-6)
Benzene	0.06	1	4.8	-	0.06	1	0.45	RX-1 (0.5-2.5)
Ethylbenzene	1	4	41	-	1	4	1.1 – 6.4	RX-1 (0.5-2.5)
n-Butylbenzene	12	4	100	-	12	4	14 – 30	G1 (9-15)
n-Propylbenzene	3.9	7	100	-	3.9	7	4.4 – 75	G1 (9-15)
Total Xylenes	0.26	1	100	-	1.6	1	2.7	RX-1 (0.5-2.5)

- No exceedances detected
J – Estimated value

These petroleum-related VOC exceedances are likely indicative of a source in the northeast portion of the Site related to gasoline filling station operations.

4.2.1.2 Semivolatile Organic Compounds in Soil

A summary of the SVOC exceedances in the soil samples analyzed is provided below:

SVOC Exceedances of SCOs in Soil

Analyte	NYSDEC UUSCO (mg/kg)	Detections above NYSDEC UUSCOs	NYSDEC RRSCOs (mg/kg)	Detections above NYSDEC RRSCOs	NYSDEC PGWSCOs (mg/kg)	Detections above NYSDEC PGWSCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
Benzo[a]anthracene	1	1	1	1	1	1	1.5	RX-29 (5-7) DUP
Benzo[a]pyrene	1	1	1	1	22	-	1.5 J	RX-29 (5-7) DUP
Benzo[b]fluoranthene	1	1	1	1	1.7	1	2 J	RX-29 (5-7) DUP
Chrysene	1	1	3.9	-	1	1	1.3	RX-29 (5-7) DUP
Indeno [1,2,3-cd] pyrene	0.5	1	0.5	1	8.2	-	0.83	RX-29 (5-7) DUP

- No exceedances detected
J – Estimated value
Sample counts above include exceedances in the duplicates
There were no exceedances in the parent sample associated with RX-29(5-7)

The SVOCs, exclusively PAHs, detected in soil are indicative of urban fill and exceedances of UUSCOs were limited to one duplicate sample.

4.2.1.3 Metals in Soil

A summary of the Metals exceedances in the soil samples analyzed is provided below:

Metal Exceedances of SCOs in Soil

Analyte	NYSDEC UUSCO (mg/kg)	Detections above NYSDEC UUSCOs	NYSDEC RRSCOs (mg/kg)	Detections above NYSDEC RRSCOs	NYSDEC PGWSCOs (mg/kg)	Detections above NYSDEC PGWSCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
Arsenic	13	4	16	2	16	2	15 – 46.2	RX-2 (0.5-2.5)
Barium	350	2	400	2	820	-	363 – 532 J	RX-27 (3-5)
Cadmium	2.5	9	4.3	6	7.5	6	2.7 – 53	SB-21-09 (0-2)
Copper	50	23	270	2	1720	-	54.9 – 473	RX-8 (0.5-2.5)
Lead	63	38	400	3	450	3	65.8 – 631	SB-21-05 (4-6)
Mercury	0.18	26	0.81	7	0.73	9	0.21 – 6.4	RX-26 (3-5)
Nickel	30	4	310	-	130	-	44.4 – 66	SB-21-04 (0-2)
Zinc	109	45	10000	-	2480	1	111 – 2560	SB-21-09 (0-2)

-No exceedances detected/no SCO available
J – Estimated value
Sample counts above include exceedances in the duplicates

The metals detected in soil are indicative of urban fill.

4.2.1.4 Polychlorinated Biphenyls in Soil

A summary of the PCBs exceedances in the soil samples analyzed is provided below:

PCB Exceedances of SCOs in Soil

Analyte	NYSDEC UUSCO (mg/kg)	Detections above NYSDEC UUSCOs	NYSDEC RRSCOs (mg/kg)	Detections above NYSDEC RRSCOs	NYSDEC PGWSCOs (mg/kg)	Detections above NYSDEC PGWSCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
PCBs	0.1	3	1	-	3.2	-	0.11 – 0.39	RX-27 (3-5)

-No exceedances detected

The PCBs detected in soil are indicative of urban fill.

4.2.1.5 Pesticides and Herbicides in Soil

A summary of the Pesticides and Herbicides exceedances in the soil samples analyzed is provided below:

Pesticide and Herbicide Exceedances of SCOs in Soil

Analyte	NYSDEC UUSCO (mg/kg)	Detections above NYSDEC UUSCOs	NYSDEC RRSCOs (mg/kg)	Detections above NYSDEC RRSCOs	NYSDEC PGWSCOs (mg/kg)	Detections above NYSDEC PGWSCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
4,4'-DDE	0.0033	6	8.9	-	17	-	0.004 J – 0.03	SB-21-09 (0-2)
4,4'-DDT	0.0033	7	7.9	-	136	-	0.0046 JP – 0.068	SB-21-09 (0-2)

-No exceedances detected
J – Estimated value
P – The RPD between the results for the two columns exceeds the method specified criteria
RPD – Relative Percent Difference

The pesticides detected in soil are indicative of urban fill.

4.2.1.6 PFAS in Soil

PFAS were not detected in exceedance of the soil cleanup guidance in any of the soil samples analyzed.

4.2.2 Groundwater Sampling Results

A total of 5 groundwater samples and one field duplicate samples were collected from three permanent groundwater monitoring wells, one geotechnical well, and one temporary well on-Site. The Site-wide analytical groundwater data was compared to NYSDEC AWQSGVs for Class GA groundwater as noted in the RIWP in order to evaluate groundwater quality and to determine the contamination in groundwater, if present. However, it should be noted that the groundwater beneath the Site is not currently used as a drinking water source and will not be used in the future.

Field parameters measured during groundwater sampling purging activities are provided on field datasheets included in **Appendix D** of the RIR. The field parameter data were reviewed to evaluate any potential anomalies in general groundwater chemistry that could potentially be influencing the groundwater sampling results. No anomalies were noted and the field parameters measured during purging appear to be consistent with values expected to occur in the natural environment.

Analytes that exceeded NYSDEC PGWSCOs in Site-wide soil were compared to analyte detections in Site-wide groundwater to assess whether, and to what extent, constituents detected in soil are impacting groundwater quality. An evaluation of soil exceedances and groundwater detections is provided in the below sections.

Laboratory analytical data generated for groundwater is summarized in **Tables 8 through 13**. Monitoring well locations with groundwater sample exceedances of AWQSGVs are shown on **Plate 2**.

A summary of groundwater quality results is provided in the below sections.

4.2.2.1 Volatile Organic Compounds in Groundwater

A summary of the VOC exceedances in the groundwater samples analyzed is provided below:

VOC Exceedances of AWQSGVs in Groundwater

Analyte	NYSDEC AWQSGVs (µg/L)	Detections above NYSDEC AWQSGVs	Range in Concentration Above NYSDEC AWQSGVs (µg/L)	Sample with Maximum Detection
Benzene	1	2	23 – 54 J	RX-2
Chloroform	7	1	8.2	MR-9
Ethylbenzene	5	2	11 – 28	RX-2
Isopropylbenzene	5	2	150 – 280	RX-2
m,p-Xylene	5	2	7.1 – 7.4	MW-21-01
n-Butylbenzene	5	2	17 – 45	RX-2
n-Propylbenzene	5	2	230 – 740 J	RX-2
sec-Butylbenzene	5	2	12 – 28	RX-2
Toluene	5	1	5.5	RX-2
Xylenes, Total	5	2	8.7 – 8.9	MW-21-01

J – Estimated value

This exceedances of the AWQSGVs for petroleum-related VOCs are focused on the northeast corner of the Site near the area of former gasoline filling station operations. Most of the VOCs exceeding PGWSCOs are petroleum related compounds (benzene, ethylbenzene, n-butylbenzene, n-propylbenzene, and total xylenes) and are also located in the northeast corner of the Site. These exceedances are likely due to former service station operations impacting soil and groundwater at the Site.

4.2.2.2 Semivolatile Organic Compounds in Groundwater

A summary of the SVOC exceedances in the groundwater samples analyzed is provided below:

SVOC Exceedances of AWQSGVs in Groundwater

Analyte	NYSDEC AWQSGVs (µg/L)	Detections above NYSDEC AWQSGVs	Range in Concentration Above NYSDEC AWQSGVs (µg/L)	Sample with Maximum Detection
Naphthalene	**10**	1	90	RX-2

This exceedance of the AWQSGV for SVOCs is likely due to sediment present in the unfiltered sample from urban fill and does not indicate SVOCs are a source of groundwater impacts.

4.2.2.3 Metals in Groundwater

A summary of the metals exceedances in the groundwater samples analyzed is provided below:

Metals Exceedances of AWQSGVs in Groundwater

	Analyte	NYSDEC AWQSGVs (µg/L)	Detections above NYSDEC AWQSGVs	Range in Concentration Above NYSDEC AWQSGVs (µg/L)	Sample with Maximum Detection
Total	Iron	300	4	857 – 20,000	MR-21-01
	Lead	25	1	209	RX-2
	Magnesium	35,000	3	35,300 – 46,900	RX-2

	Analyte	NYSDEC AWQSGVs (µg/L)	Detections above NYSDEC AWQSGVs	Range in Concentration Above NYSDEC AWQSGVs (µg/L)	Sample with Maximum Detection
	Manganese	300	3	424 – 2,400	MW-21-01
	Selenium	10	1	11.7	MR-9
	Sodium	20,000	5+DUP	261,000 – 615,000	MR-9
Dissolved	Magnesium	35,000	1	35,600	MW-21-02
	Manganese	300	1	2,290	MW-21-01
	Sodium	20,000	3+DUP	270,000 – 644,000	MW-21-02

All of the metals detected above AWQSGVs in the filtered samples are naturally occurring. The exceedances of AWQSGVs for non-naturally occurring metals are likely due to sediment present in the unfiltered samples from urban fill and to not indicate metals are a source of groundwater impacts.

4.2.2.4 Polychlorinated Biphenyls in Groundwater

PCBs were not detected in any groundwater samples, as shown on **Plate 2**.

4.2.2.5 Pesticides and Herbicides in Groundwater

Pesticides and herbicides were not detected in any groundwater samples, as shown on **Plate 2**.

4.2.2.6 PFAS in Groundwater

There are no NYSDEC AWQSGVs for PFAS, and therefore, exceedances of the October 2021 Proposed Guidance Values (GVs) for Human Health are presented on **Plate 3**. A summary of the exceedances of the GVs for PFOS and PFOA are provided in the below table:

PFAS Detections in Groundwater (in nanograms per liter [ng/L]

Analyte	NYSDEC Proposed GVs[1] (ng/L)	Detections Above NYSDEC MCLs	Detection Range (ng/L)*	Groundwater Sample with Maximum Detection
Perfluorooctanesulfonic Acid (PFOS)	2.7	3+DUP	7.23 B – 23.5 B	MW-21-02
Perfluorooctanoic Acid (PFOA)	6.4	3+DUP	7.24 – 31.2	MW-21-02

There is no documented use of PFAS at the Site and known historical Site use that would indicate the past use of these compounds. Therefore, the presence of PFAS is due to background levels of these compounds in New York City, likely due to urban fill.

4.2.3 Soil Vapor Sampling Results

A total of four soil vapor samples and one field duplicate soil vapor sample were collected from new soil vapor points and submitted for laboratory analysis. Laboratory analytical data generated for soil vapor is summarized in **Table 14**. Soil vapor point locations with soil vapor sample detections are shown on **Plate 3.**

[1] The proposed guidance values shown in this table were published in October 2021 as an addendum to June 1998 Division of Water Technical and Operational Guidance Series (TOGS) No. 1.1.1. The proposed guidance values underwent public comment through December 2021 but have not yet been formally adopted as final.

A summary of soil vapor quality results is provided in the below sections.

Analytical data for soil vapor VOCs indicates there were detections of 37 different VOCs across the Site, including petroleum-related and chlorinated VOCs.

Analyte	Detections	Range in Concentrations ($\mu g/m^3$)	Sample with Maximum Detection
1,1,1-Trichloroethane (TCA)	1	6 J	V-5
1,2,4-Trimethylbenzene	3+DUP	0.42 J – 2	SV-21-04
1,3,5-Trimethylbenzene (Mesitylene)	3	0.29 J – 0.52 J	SV-21-04
1,3-Butadiene	1	13	V-5
1,3-Dichlorobenzene	1	1.3	SV-21-04
2-Hexanone	1+DUP	3.2 – 18	SV-21-05
4-Ethyltoluene	3	0.27 J – 0.63 J	SV-21-04
4-Methyl-2-pentanone (MIBK)	2	1.2 J – 2.2	SV-21-04
Acetone	3+DUP	20 – 95	SV-21-05
Benzene	5+DUP	1 – 5400 J	V-3
Butane	6+DUP	3.8 B – 24000	V-3
Carbon Disulfide	4+DUP	0.41 J – 21 J	V-5
Carbon Tetrachloride	2+DUP	0.26 – 0.35	SV-21-05 (DUP)
Chlorobenzene	1	0.32 J	SV-21-04
Chlorodifluoromethane	2+DUP	0.97 J – 1.1 J	SV-21-04
Chloroform	4+DUP	0.4 J – 27	V-5
Chloromethane	2+DUP	0.87 J – 1	SV-21-05 (DUP)
Cyclohexane	4	0.55 J - 11000	V-3
Dichlorodifluoromethane	3+DUP	2.1 J – 2.5 DJ	SV-21-05
Ethylbenzene	3+DUP	1.1 – 11 D	SV-21-05
Freon 113	1	0.42 J	SV-21-06
Isooctane	6+DUP	2.4 - 1100000	V-3
Isopropanol	2	6.4 J – 12	SV-21-04
Isopropylbenzene (Cumene)	1	5300 J	V-3
m,p-Xylene	4+DUP	3.5 – 37 D	SV-21-05
Methyl Ethyl Ketone (2-Butanone)	4+DUP	11 J – 350 D	SV-21-05
Methylene Chloride	1	3.3	SV-21-04
N-Heptane	5	3.6 D – 24000	V-3
N-Hexane	5	4.5 - 20000	V-3
N-Propylbenzene	2	0.41 J – 4500 J	V-3
O-Xylene (1,2-Dimethylbenzene)	3+DUP	1.3 – 11 D	SV-21-05
p-Isopropyltoluene	1	0.25 J	SV-21-04
Styrene	1	0.41 J	SV-21-04
Tert-Butyl Alcohol	1	4.5 J	SV-21-04
Tetrachloroethylene (PCE)	3+DUP	0.91 J – 26	V-5

Analyte	Detections	Range in Concentrations (µg/m^3)	Sample with Maximum Detection
Toluene	4+DUP	6.7 - 1300	V-5
Trichlorofluoromethane	2+DUP	1.1 – 1.2	SV-21-04 and SV-21-05 (DUP)

J – Estimated value
D – Concentration of analyte was quantified from diluted analysis.

The following chlorinated VOCs are discussed because they are included in the NYSDOH Guidance. Matrix A provides guidance relative to trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene (1,1-DCE), and carbon tetrachloride. Matrix B provides guidance relative to PCE, 1,1,1-trichloroethane (1,1,1-TCA), and methylene chloride. Matrix C provides guidance to vinyl chloride. No indoor air samples were collected since the current onsite building is unoccupied and demolition is underway; therefore, no direct comparison is made to the NYSDOH Matrices. A summary of the detections is described below. Additional compounds detected besides those noted below are included in **Table 14**.

Matrix A Compounds

- Carbon tetrachloride was detected in three soil vapor samples (including the duplicate), ranging in concentration from 0.26 to 0.35 µg/m^3, with a maximum detection in soil vapor sample SV-21-05 DUP.
- 1,1-DCE, cis-1,2-DCE, and TCE were not detected in soil vapor.

Matrix B Compounds

- Methylene chloride was detected in at a concentration of 3.3 µg/m^3 at SV-21-04.
- PCE was detected in four soil vapor samples (including the duplicate), ranging in concentration from 0.91 J µg/m^3 to 26 µg/m^3, with a maximum detection in soil vapor sample V-5.
- 1,1,1-TCA was detected at a concentration of 6 J µg/m^3 at soil vapor sample V-5.

Matrix C Compound

- Vinyl chloride was not detected in soil vapor.

The relatively low-level concentrations of chlorinated VOCs, combined with the absence of these compounds in groundwater and soil, indicate it is unlikely there is an onsite source of CVOC impacts.

Petroleum-related VOCs detected in soil vapor are also present in soil and groundwater, specifically in the northeast corner of the Site. These impacts are likely due to former service station operations impacting the subsurface at the Site.

4.2.4 Data Usability Summary and Field Duplicate Results

Data validation was performed on all data collected during the RI to determine whether the data, as presented, meets the Site-specific criteria for data quality and data use. Data qualifiers are included on the data tables. The laboratory reported the results for data in ASP Category B deliverable packages, which are provided as Appendix E of the RIR. An electronic data deliverable (EDD) in the required NYSDEC format was/will be provided by the laboratory. A DUSR, in accordance with Appendix 2B of DER-10, is provided in Appendix F of the RIR.

4.2.5 Investigation Derived Waste

Soil cuttings generated were returned to the borehole. Purged groundwater were drummed, labelled, and will be disposed of during the remedial action. One drum of non-hazardous groundwater was generated.

4.2.6 Potential Underground Storage Tank

On November 10, 2021, during preclearing at the SB-21-01 location in the northeast portion of the Site, a metallic refusal was encountered at 2.5 ft bls. The object was not damaged by the hand tools used during preclearance. The boring location was moved approximately 7 ft east, where the same refusal was encountered at the same depth. SB-21-01 was then moved north a few feet north toward 207th and successfully cleared down to 6 ft bls and drilled to final depth. Based on field observations, the object is suspected to be a UST. The NYSDEC BCP case manager was notified that day by email and the discovery was noted in the daily report. Further investigation will occur during the remedial action. If a UST is present, it will be registered (if necessary) and removed in accordance with the RAWP.

5. Conceptual Site Model

The following section explains the occurrence of contaminants and their fate and transport at the Site in the context of the local Site stratigraphy and hydrogeology. As noted previously, the text of this section is identical to Section 5 in the RIR.

Based on the soil, groundwater, and soil vapor results discussed in Section 4.2, soil, groundwater, and soil vapor are impacted by petroleum-related VOCs in the northeast portion of the Site in the area of former gasoline filling station operations and a suspected UST discovered during the RI. Based on the Site-wide detections and exceedances of NYSDEC UUSCOs (and/or guidance values for PFOS and PFOA), soil impacts also include SVOCs (exclusively PAHs), metals, pesticides/herbicides, PCBs, PFOS and PFOA, likely due to urban fill materials across the Site. The spatial distribution of contaminants of potential concern in various media is shown in **Plates 1 through 3**.

As discussed in Section 4.2.2, groundwater is not significantly impacted, although some petroleum-related impacts are present in the northeast portion of the Site, likely due to former service station operations. VOCs were detected in groundwater above the NYSDEC AWQSGVs, but at relatively low concentrations, in only one of the three 2021 RI groundwater samples (MW-21-01). Some petroleum-related VOC exceedances were detected in both soil and groundwater in the northeast portion of the Site, indicating that VOCs are a contributing source of groundwater impact in this area of the Site. Some PAH and metal (non-naturally occurring metals) exceedances were identified in both soil and groundwater. However, it is likely that SVOCs and non-naturally occurring metals present in the unfiltered groundwater samples were a result of sediment present in the samples and are not representative of dissolved impacts in groundwater. This data indicates that SVOCs and metals in soil are not a significant source of groundwater contamination at the Site.

PFAS compounds were detected only in the 2021 RI groundwater samples. There is no documented use of PFAS at the Site and known historical Site use that would indicate the past use of these compounds. Therefore, the presence of PFAS is likely due to background levels of these compounds in New York City likely due to urban fill.

As discussed in Section 4.2.3, and based on the Site-wide detections, soil vapor at the Site is impacted with VOCs, including both petroleum-related and chlorinated VOCs. Chlorinated soil vapor impacts are relatively low and likely originate from off-Site sources as no on-Site source of CVOCs was identified in soil or groundwater. Petroleum related impacts in soil and groundwater in the northeastern portion of the Site likely contribute to soil vapor impacts in this area.

6. Qualitative Exposure Assessment

As described in Appendix 3B of DER-10, "The overall purpose of the Qualitative Human Health Exposure Assessment (or the exposure assessment) is to evaluate and document how people might be exposed to site related contaminants, and to identify and characterize the potentially exposed population(s) now and under the reasonably anticipated future use of the site." The following section details the Qualitative Human Health Exposure Assessment based on data discussed in previous sections of this RI. As noted previously, the text of this section is identical to Section 6 in the RIR.

6.1 Soil Exposure

As described above in Section 4.2.1, soil samples collected during the RI indicated the presence of VOCs, SVOCs, metals, PCBs, and pesticides at concentrations above the NYSDEC UUSCOs. An individual could be exposed to these contaminants through direct contact with Site soil during ground intrusive work at the Site. Direct contact without the use of proper personal protective equipment (PPE) and personal hygiene measures could lead to dermal contact and incidental ingestion of these compounds. Since the Site is currently fully fenced and will be fully fenced during construction activities, and access is controlled, potential contact with Site soil is restricted to remedial and construction contract workers at the Site performing ground intrusive activities in addition to trespassers and passersby (through potential particulate matter in the air). The general public will not be exposed to direct contact with Site soil. A CAMP and dust control measures (as needed) will be implemented during intrusive activities to minimize the potential for offsite exposures from soil/dust/vapor leaving the Site.

Substantial remedial excavation will occur to remove on-Site contamination. The suspected UST in the northeast portion of the Site will also be removed as part of the remedial action. The proposed remedy that will be described in the RAWP includes addressing impacted soil through excavation to meet UUSCOs. In the unlikely event that areas of the Site are not remediated to UUSCOs, institutional controls (Site Management Plan [SMP] and environmental easement) will be put in place to minimize the potential for exposure by direct contact with remaining contamination both the public and any future construction workers performing ground intrusive activities at the Site.

6.2 Groundwater Exposure

As described above in Section 4.2.2, groundwater samples collected during the RI indicated that VOCs, SVOCs, and metals are present at concentrations above the NYSDEC AWQSGVs and that PFOS/PFOA are present above the October 2021 Proposed Guidance Values (GVs) for Human Health. Groundwater is not used for drinking or other potable purposes (the area is connected to the public water supply), and there is no direct contact with or ingestion of groundwater by the general public. Furthermore, no public water supply wells are located in the area surrounding the Site. The substantial remedial excavation that will be undertaken during the remedial action will remove potential petroleum source material in the northeast portion of the Site. The suspected UST will also be removed. As a result, the petroleum-related impacts in groundwater are expected to reduce over time.

Individuals who perform intrusive work (i.e., utility construction and/or repair), perform groundwater sampling or remedial activities may come into contact with contaminated groundwater. Proper PPE and personal hygiene measures will be required to prevent dermal contact and the potential for incidental ingestion of these compounds.

The proposed on-Site buildings will be serviced by the public water supply. Based on this, the potential for public exposure by direct contact with contaminated groundwater will be reduced or eliminated.

6.3 Soil Vapor Exposure

As described above in Section 4.2.3, soil vapor samples collected during the RI indicate the presence of petroleum-related VOCs and chlorinated VOCs across the Site. No source of low-level chlorinated VOCs was identified at the Site. Petroleum-related VOCs were detected at higher levels than chlorinated VOCs, likely due to former service station operations in the northeast portion of the Site. The substantial remedial excavation that will be undertaken during the remedial action will remove potential petroleum source material in the northeast portion of the Site. The suspected UST will also be removed. As a result, the relatively minimal petroleum-related impacts in soil vapor are expected to reduce over time.

Individuals who perform ground intrusive work and passersby during the remedial action may be exposed to contaminated soil vapor. A CAMP and odor/vapor control measures (as needed) will be implemented during intrusive activities to minimize the potential for offsite exposures from vapors leaving the Site during the remedial action.

Soil vapor intrusion is not a concern for the Site and mitigation measures are not proposed. The building foundation extends below the water table across the site. A waterproofing membrane/vapor barrier will be installed as part of the development.

6.4 Exposure Assessment Summary

The following table summarizes the exposure assessment.

Environmental Media and Exposure Route	Human Exposure Assessment
Direct contact with subsurface soils (and incidental ingestion)	• Construction and remedial contractors can come into contact with soil if they complete ground intrusive work at the Site. • During remediation, remedial workers, trespassers, passersby, and utility workers could come into contact with contaminated soil contained in dust through inhalation, incidental ingestion, and dermal contact. Implementation of the HASP, CAMP and dust controls during the remedial action and any future ground intrusive activities will mitigate potential exposures.
Ingestion of groundwater	• Groundwater is not and will be not used for drinking water, as any future buildings proposed on the Site will be connected to the public water supply.
Direct contact with groundwater (and incidental ingestion)	• Remedial workers, trespassers, and utility workers could come into contact with contaminated groundwater through dermal contact and incidental ingestion during ground intrusive work. • Proper PPE and personal hygiene measures, as defined in the HASP, will be required to prevent dermal contact and the potential for incidental ingestion impacted groundwater during construction. • Future exposure to Site groundwater will be eliminated by the presence redevelopment that covers the entire Site.

Environmental Media and Exposure Route	Human Exposure Assessment
Inhalation of air (exposures related to soil vapor intrusion)	• Remedial workers, trespassers, and utility workers may be exposed to contaminated soil vapor during ground intrusive. • Exposures to workers and passersby during the remedial action and future ground intrusive activities will be reduced or eliminated through implementation of the HASP, CAMP, and odor/vapor controls during construction. • A soil vapor intrusion evaluation will be completed based on a review of RI data, post-remedial soil end-point confirmation data and other considerations (e.g., building foundation depth below water table, use of waterproofing membrane/vapor barrier as a construction element, etc.). The evaluation will include a provision for implementing actions recommended, if necessary, to address exposures related to soil vapor intrusion.

7. Remedial Action Objectives

The goal of the remedy selection process in the BCP is to select a remedy for a site that is protective of public health and the environment, taking into account the current, intended and reasonably anticipated land use of the site. Consistent with Part 375, the proposed remedies for the Site will be fully protective of public health and the environment, taking into account the current, intended, and potential future land use. Based on the results of the Remedial Investigation, the following RAOs have been identified for this Site:

7.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standards.

RAOs for Environmental Protection

- Remove the source of groundwater contamination.
- Restore groundwater to pre-disposal/pre-release conditions, to the extent practicable.

7.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation exposure to contaminants volatilizing from soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater, surface water, or sediment contamination.

7.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site.

8. Description of Remedial Action Plan

The following is a detailed description of the alternatives analysis and remedy selection process to address impacted media on the Site.

This section of the RAWP was prepared in accordance with Subpart 375 – 3.8(f), Subpart 375 – 1.8(f), and Section 4.3 of DER-10. Two remedial alternatives (one being an unrestricted use scenario) were evaluated, as follows:

- One alternative (Remedial Alternative 1) that will achieve an Unrestricted Use cleanup relative to on-Site soil (Track 1) without the use of institutional controls (ICs) or engineering controls (ECs) as shown on **Figure 6**; and
- One alternative (Remedial Alternative 2) that will achieve a Track 2 remedy for the Site, as shown on **Figure 7**. It will achieve a Track 2 Restricted Residential use cleanup coupled with the use of ICs.

Remedial Alternative 1: Track 1 Unrestricted Use Cleanup (Figure 6):

1. Installation of support of excavation (SOE) to reach the proposed remedial excavation depths to meet Track 1.
2. Removal of the suspected UST and any associated petroleum-impacted soil from the northeast portion of the Site.
3. Excavation and off-Site disposal of approximately 6,200 in-place cubic yards (cy) of soil (i.e., all soil exceeding UUSCOs) over the entire Site. The limits and approximate depths of remedial excavation are shown on **Figure 6**. This source removal will improve groundwater and soil vapor quality. Final remedial disposal quantities will be based on confirmation endpoint samples and actual truck weights.
4. Collection and analysis of excavation bottom endpoint samples at a frequency of one per 900 square feet to document that the SCOs were met. Sidewall samples are not.
5. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the Site, if required.
6. Dewatering, in compliance with city, state, and federal laws and regulations required to meet remedial excavation depths. Extracted groundwater will be treated on-Site under a permit from New York City Department of Environmental Protection to meet pretreatment requirements prior to discharge to the sewer system. This dewatering will improve groundwater quality and remove a source of petroleum-related soil vapor impacts.
7. As part of the Track 1 remedy, a soil vapor intrusion evaluation will be completed. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion, although based on the RI data collected and the remedial action proposed to reach Track 1 (which will remove all soil that may be a potential on-Site source of soil vapor), there will be no remaining on-Site source of vapor intrusion. In addition, the building's foundation will sit several feet below the water table, therefore there will be no soil vapor beneath the building. As such, this will preclude soil vapor sampling, which is an important component of a soil vapor intrusion evaluation (indoor air sampling alone does not provide the full picture and can be misleading). It will also preclude installation of a sub-slab mitigation system. As part of the building's design, and in line with NYSDEC green remediation principles, a full waterproofing membrane will be installed beneath the slab and up the foundation walls, which will increase the energy efficiency of the building. Considering all of these elements together, once the remedial action and building construction is complete, the potential for soil vapor intrusion will be addressed and will be documented in the FER.

Remedial Alternative 2: Track 2 Restricted Residential Cleanup (Figure 7):

1. Installation of SOE to reach the proposed remedial excavation depths.
2. Removal of the suspected UST and any associated petroleum-impacted soil from the northeast portion of the Site.
3. Excavation and off-Site disposal of a total of approximately 3,932 in-place cy of soil across the Site to achieve Track 2. The limits and approximate depths of excavation are shown on Figure 7. This source removal will improve groundwater and soil vapor quality.
4. Collection and analysis of excavation bottom endpoint samples at a frequency of one per 900 square feet to document that the SCOs were met. Sidewall samples are not required.
5. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the Site, if required.
6. Dewatering, in compliance with city, state, and federal laws and regulations. Extracted groundwater will be treated on-Site under a permit from New York City Department of Environmental Protection to meet pretreatment requirements prior to discharge to the sewer system. This dewatering will improve groundwater quality and remove a source of petroleum-related soil vapor impacts.
7. As part of the remedy, a soil vapor intrusion evaluation will be completed. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion, if necessary.
8. Imposition of an institutional control in the form of an Environmental Easement for the portions of the Site that do not achieve a Track 1 cleanup to ensure proper Site use and to prevent future exposure to any residual contamination remaining in these areas.
    - requires the remedial party or Site owner to complete and submit to the NYSDEC a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
    - allows the continued use and development of the controlled property for restricted residential (or less restrictive uses) as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
    - restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or Article 141 of the NYCDOH code (groundwater restriction applies to the entire Site); and
    - requires compliance with the Department approved SMP.
9. If necessary, a SMP is required for all portions of the Site that do not achieve a Track 1 Unrestricted Use cleanup which includes the following:
    - an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the Site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:
        - Institutional Controls: The Environmental Easement discussed above; and
    - a Monitoring Plan to assess the performance and effectiveness of the remedy, including, if necessary, monitoring for vapor intrusion for any buildings constructed on the Site.

8.1 Evaluation of Remedial Alternatives

The goal of the remedy selection process under the BCP is to select a remedy that is protective of human health and the environment taking into consideration the current, intended, and reasonably anticipated future use of the property. Each remedial alternative is evaluated based on the factors listed below:

- Protection of human health and the environment;
- Compliance with standards, criteria, and guidelines (SCGs);

- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance; and
- Land use.

SCGs applicable to the Site remediation are described briefly below:

- 6 NYCRR Part 375-6 Soil Cleanup Objectives – The UUSCOs, RRSCOs and PGWSCOs listed in the guidance were used to evaluate soils, delineate areas with impacts, and specify cleanup objectives;
- New York State Groundwater Quality Standards – 6 NYCRR Part 703 – 6 NYCRR Subpart 703; the standards listed in the guidance were used to evaluate groundwater quality, delineate areas with impacts, and specify cleanup objectives;
- NYSDEC Ambient Water Quality Standards and Guidance Values – TOGS 1.1.1 – the standards listed in the guidance were used to evaluate groundwater quality, delineate areas with impacts, and specify cleanup objectives (TOGS 1.1.1 incorporates the same standards as listed in 6 NYCRR Part 703 for the constituents of concern at the Site);
- NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation – May 2010 (or later version if available) – the proposed remedial alternatives were developed in accordance with the abovementioned document;
- NYSDOH Generic Community Air Monitoring Plan – will be required for all ground intrusive activities, and the abovementioned document was used to prepare the CAMP;
- NYS Waste Transporter Permits – 6 NYCRR Part 364 – As the remedial alternatives include excavation and disposal of soil, the abovementioned guidance document applies;
- NYS Solid Waste Management Requirements – 6 NYCRR Part 360 and Part 364 – As the remedial alternatives include excavation and disposal of soil, the abovementioned guidance document applies;
- NYSDEC guidance regarding PFAS dated January 2021; and
- NYSDOH Guidance was used to develop the soil vapor sampling program.

8.1.1 Overall Protection of Human Health and the Environment

This criterion is an evaluation of the ability of each alternative or the remedy to protect public health and the environment.

Remedial Alternative 1, Track 1 will be protective of human health and the environment by removing soil at the Site that exceeds the UUSCOs and backfilling the area with material meeting the UUSCOs (as necessary), thus eliminating the potential for human and environmental exposure to contaminated soil/fill once construction is complete. The suspected UST and any associated petroleum-impacted soil will be removed from the northeast portion of the Site. Groundwater impacts indicative of a potential on-Site source from the former filling station are present in the northeast corner of the Site. Elsewhere on-Site groundwater is not significantly impacted. Groundwater is not used for potable purposes. Groundwater impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that

exceeds the UUSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite groundwater quality. Chlorinated soil vapor impacts are relatively low and likely originate from off-Site sources as no on-Site source of CVOCs was identified in soil or groundwater. Petroleum-related soil vapor impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the UUSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite soil vapor quality and mitigate offsite migration.

A soil vapor intrusion evaluation will be completed as part of the remedy. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion, although based on the RI data collected and the remedial action proposed to reach Track 1 (which will remove all soil that may be a potential on-Site source of soil vapor), there will be no remaining on-Site source of vapor intrusion. In addition, the building's foundation will sit several feet below the water table, therefore there will be no soil vapor beneath the building. As such, this will preclude soil vapor sampling, which is an important component of a soil vapor intrusion evaluation (indoor air sampling alone does not provide the full picture and can be misleading). It will also preclude installation of a sub-slab mitigation system. As part of the building's design, and in line with NYSDEC green remediation principles, a full waterproofing membrane will be installed beneath the slab and up the foundation walls, which will increase the energy efficiency of the building. Considering all of these elements together, once the remedial action and building construction is complete, the potential for soil vapor intrusion will be addressed and will be documented in the FER.

Remedial Alternative 2, Track 2 will be protective of human health and the environment by excavating and removing soil above the RRSCOs across the Site, by backfilling as necessary with material meeting the applicable SCOs and by employing ICs. The suspected UST and any associated petroleum-impacted soil will be removed from the northeast portion of the Site. ICs including a SMP and Environmental Easement, will ensure long-term management of use restrictions. Groundwater impacts indicative of a potential on-Site source from the former filling station are present in the northeast corner of the Site. Elsewhere on-Site groundwater is not significantly impacted. Groundwater is not used for potable purposes. Groundwater impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the lower of PGWSCOs or RRSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite groundwater quality. Chlorinated soil vapor impacts are relatively low and likely originate from off-Site sources as no on-Site source of CVOCs was identified in soil or groundwater. Petroleum-related soil vapor impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the lower of PGWSCOs or RRSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite soil vapor quality and mitigate offsite migration. A soil vapor intrusion evaluation will be completed as part of the remedy.

For both alternatives, during Site remediation (e.g., excavation of soil, etc.) and other construction activities, workers may be exposed to impacted soil and soil vapor. Potential worker exposure during remediation activities will be mitigated through the implementation of the HASP, which includes the CAMP, and required worker training. Potential environmental exposures will be mitigated by ECs implemented during remedial construction (i.e., dust suppression, odor control and traffic control). The SMP will include ICs and ECs to be implemented during future ground intrusive work to protect the workers and public from remaining contamination on-Site where Track 1 is not met.

8.1.2 Standards, Criteria, and Guidance

The remedy must conform to officially promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance as appropriate.

Remedial Alternative 1 will achieve compliance with the UUSCOs for all on-Site areas. The handling and management of contaminated materials will be in compliance with the applicable SCGs. The suspected UST and any associated petroleum-impacted soil will be removed from the northeast portion of the Site. The excavation will be backfilled as necessary, with material meeting the Track 1 UUSCOs presented in the Part 375 Regulations. Groundwater impacts indicative of a potential on-Site source from the former filling station are present in the northeast corner of the Site. Elsewhere on-Site groundwater is not significantly impacted. Groundwater is not used for potable purposes. Groundwater impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the UUSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite groundwater quality. Petroleum-related soil vapor impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the UUSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite soil vapor quality and mitigate offsite migration. A soil vapor intrusion evaluation will be completed as part of the remedy.

Remedial Alternative 2 will achieve compliance with the RRSCOs through the removal of all soil exceeding these criteria and backfilling as necessary with material meeting the applicable SCOs presented in the Part 375 Regulations. The suspected UST and any associated petroleum-impacted soil will be removed from the northeast portion of the Site. The handling and management of contaminated materials will be in compliance with the applicable SCGs. Groundwater impacts indicative of a potential on-Site source from the former filling station are present in the northeast corner of the Site. Elsewhere on-Site groundwater is not significantly impacted. Groundwater is not used for potable purposes. Groundwater impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the lower of PGWSCOs or RRSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite groundwater quality. Petroleum-related soil vapor impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the lower of RRSCOs and PGWSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite soil vapor quality and mitigate offsite migration. A soil vapor intrusion evaluation will be completed as part of the remedy.

8.1.3 Long-Term Effectiveness and Permanence

This criterion is an evaluation of the long-term effectiveness and permanence of an alternative or remedy after implementation.

Remedial Alternative 1 removes all impacted soil. The suspected UST and any associated petroleum-impacted soil will be removed from the northeast portion of the Site. Therefore, incremental risk from soil impacts will be eliminated, ECs and ICs are not necessary, and the remedy will continue to meet RAOs in the future, thus providing a permanent long-term solution for the Site. Groundwater impacts indicative of a potential on-Site source from the former filling station are present in the northeast corner of the Site. Elsewhere on-Site groundwater is not significantly impacted. Groundwater is not used for potable purposes. Groundwater impacts in the northeast portion of the Site will be addressed through removal of the suspect

UST, excavation of all soil that exceeds the UUSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite groundwater quality and provide a long-term solution for the Site. Chlorinated soil vapor impacts are relatively low and likely originate from off-Site sources as no on-Site source of CVOCs was identified in soil or groundwater. Petroleum-related soil vapor impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the UUSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite soil vapor quality and mitigate offsite migration. A soil vapor intrusion evaluation will be completed as part of the remedy.

Remedial Alternative 2 removes all impacted soil above RRSCOs. The suspected UST and any associated petroleum-impacted soil will be removed from the northeast portion of the Site.

ICs including a SMP and Environmental Easement, will ensure long-term management of use restrictions for areas not meeting Track 1. The SMP will ensure long-term effectiveness of all ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as intended. Groundwater impacts indicative of a potential on-Site source from the former filling station are present in the northeast corner of the Site. Elsewhere on-Site groundwater is not significantly impacted. Groundwater is not used for potable purposes. Groundwater impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the lower of PGWSCOs or RRSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite groundwater quality and provide a long-term solution for the Site. Chlorinated soil vapor impacts are relatively low and likely originate from off-Site sources as no on-Site source of CVOCs was identified in soil or groundwater. Petroleum-related soil vapor impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the lower of RRSCOs and PGWSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite soil vapor quality and mitigate offsite migration. A soil vapor intrusion evaluation will be completed as part of the remedy.

8.1.4 Reduction in Toxicity, Mobility, or Volume of Contamination Through Treatment

This criterion is an evaluation of the ability of an alternative or remedy to reduce the toxicity, mobility, and volume of Site contamination. Preference should be given to remedies that permanently or significantly reduce the toxicity, mobility, or volume of the contamination at the Site. The following is the hierarchy of source removal and control measures, ranked from most preferable to least preferable:

- Removal and/or treatment;
- Containment;
- Elimination of exposure; and
- Treatment of source at the point of exposure.

Remedial alternatives that use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce the total volume of contaminated media are preferable.

Remedial Alternative 1 permanently eliminates the toxicity, mobility, and volume of contaminants within the Site by removing all soil with concentrations that exceeded the UUSCOs. The suspected UST and any associated petroleum-impacted soil will be removed from the northeast portion of the Site. Groundwater

impacts indicative of a potential on-Site source from the former filling station are present in the northeast corner of the Site. Elsewhere on-Site groundwater is not significantly impacted. Groundwater is not used for potable purposes. Groundwater impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the UUSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite groundwater quality. Chlorinated soil vapor impacts are relatively low and likely originate from off-Site sources as no on-Site source of CVOCs was identified in soil or groundwater. Petroleum-related soil vapor impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the UUSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite soil vapor quality and mitigate offsite migration. A soil vapor intrusion evaluation will be completed as part of the remedy.

Remedial Alternative 2 will permanently eliminate toxicity, mobility, and volume of contaminants above RRSCOs to a depth of 15 feet bls. Deeper than 15 feet bls, such contaminants may remain provided they are not a source for groundwater contamination. The suspected UST and any associated petroleum-impacted soil will be removed from the northeast portion of the Site.

ICs including a SMP and Environmental Easement, will provide a long-term remedy for the Site by eliminating exposure in areas where a Track 1 Unrestricted Use Cleanup is not achieved. Groundwater impacts indicative of a potential on-Site source from the former filling station are present in the northeast corner of the Site. Elsewhere on-Site groundwater is not significantly impacted. Groundwater is not used for potable purposes. Groundwater impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the lower of PGWSCOs or RRSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite groundwater quality. Chlorinated soil vapor impacts are relatively low and likely originate from off-Site sources as no on-Site source of CVOCs was identified in soil or groundwater. Petroleum-related soil vapor impacts in the northeast portion of the Site will be addressed through removal of the suspect UST, excavation of all soil that exceeds the lower of RRSCOs and PGWSCOs, and dewatering to achieve the remedial excavation, which will remove source material and improve onsite soil vapor quality and mitigate offsite migration. A soil vapor intrusion evaluation will be completed as part of the remedy.

8.1.5 Short-Term Impacts and Effectiveness

This criterion is an evaluation of the potential short-term adverse environmental impacts and human exposures during the construction and/or implementation of an alternative or remedy.

Remedial Alternatives 1 and 2 pose minimal health and environmental risks during implementation. The remedy implementation time is relatively short and the potential adverse impacts to the community and workers (e.g., increased traffic or exposure to contaminants during soil excavation and transportation) can be mitigated with ECs (e.g., HASP, CAMP, dust, odor, and traffic controls). Other potential risks include material handling, electrical shock, vapor inhalation, general trip hazards, and noise. These potential impacts are addressed in the Site-specific HASP and CAMP and the Soil/Materials Management Plan (SoMP), which detail monitoring during the construction and describe ECs to be implemented.

8.1.6 Implementability

This criterion is an evaluation of the technical and administrative feasibility of implementing an alternative or remedy. Both Remedial Alternatives are technically feasible and readily implementable.

The techniques, materials, and equipment to implement **Remedial Alternatives 1 and 2** are readily-available and have been proven effective in remediating the contaminants associated with the Site. Standard materials, services, and well-established technologies will be implemented. There are no specific difficulties associated with any of the activities proposed, which utilize standard construction methods.

8.1.7 Cost Effectiveness

This criterion is an evaluation of the overall cost effectiveness of an alternative or remedy.

The total cost for **Remedial Alternative 1** is estimated to be approximately $4,149,200 (no monitoring and reporting is required). The cost estimate details for Remedial Alternative 1 are provided in **Table 15**.

The total cost for Remedial **Alternative 2** is estimated to be approximately $2,875,200 with approximately $10,000/year for annual inspections and reporting in accordance with the SMP. The cost estimate details for Remedial Alternative 2 are provided in **Table 16**.

The additional capital cost required to achieve Track 1 (Remedial Alternative 1) provides the added benefit of permanently eliminating the need for long term implementation, certification and reporting related to institutional controls or the management of residual contamination in the future. The benefit of achieving a Track 1 unrestricted use cleanup outweighs the additional cost required. For this reason, Remedial Alternative 1 is considered preferable to Remedial Alternative 2.

8.1.8 Community Acceptance

This criterion is evaluated after the public review of the remedy selection process as part of the final NYSDEC selection/approval of a remedy for a site.

1. Any public comment relative to these criteria will be considered by NYSDEC after the close of the public comment period.
2. Documentation of the public comments received is to be consistent with the citizen participation plan identified for a remedial program in accordance with applicable DEC policy.

Although a full evaluation of this criterion cannot be made until after the public comment period is complete, it is expected that both alternatives will be equally as acceptable to the community.

8.1.9 Land Use

This criterion is an evaluation of the current, intended and reasonably anticipated future use of the Site and its surroundings, as it relates to an alternative or remedy, when unrestricted levels would not be achieved.

This evaluation has considered reasonably anticipated future uses of the Site and considers:

- Current use and historical and/or recent development patterns;
- Applicable zoning laws and maps;
- NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law;
- Applicable land use plans;
- Proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas;
- Environmental justice impacts, federal or state land use designations;

- Population growth patterns and projections;
- Accessibility to existing infrastructure;
- Proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site;
- Proximity to flood plains;
- Geography and geology; and
- Current ICs applicable to the Site.

Remedial Alternatives 1 and 2 are both compatible with land use and zoning.

8.2 Selection of the Preferred Remedy

The Preferred Remedy for the Site, Remedial Alternative 1 (Track 1), was selected for implementation since it meets each of the evaluation criteria. In summary, the Preferred Remedy for the Site:

- Is more protective of public health and the environment than Remedial Alternative 2;
- Removes all soil with concentrations exceeding the UUSCOs across the Site;
- Provides a higher level of long-term effectiveness and permanence than Remedial Alternative 2 through removal all soil exceeding UUSCOs;
- Reduces the toxicity, mobility, or volume of impacted material through removal of all soil exceeding UUSCOs;
- Provides short-term effectiveness, including minimal impacts to workers or the surrounding neighborhood through the implementation of ECs during construction;
- Is readily implemented;
- Can be implemented at a reasonable cost, with the benefit of achieving an unrestricted use cleanup outweighing the additional cost required; and
- Is compatible with land use.

The Preferred Remedy for the Site is consistent with the approach for a Track 1 Unrestricted use scenario. In the unlikely event that Track 1 SCOs are not achieved in the areas shown on **Figure 6**, the remedy may default to a Track 2 restricted residential use cleanup in those areas and ICs will be implemented.

8.2.1 Preferred Remedy Land Use Factor Evaluation

A land use factor evaluation of the Preferred Remedy for the Site is provided below based on the following criteria as required by Article 27, Title 14 of the Environmental Conservation Law 27-1415.

8.2.1.1 Zoning

The proposed mixed-use as affordable and market rate housing, community facilities, and commercial space is consistent with the current property zoning. The current property zoning is R9A for residential use with a C2-4 commercial overlay, and the Site is within the Special Inwood District. R9A districts typically result in high lot coverage and 14- to 15-story buildings set at or near the street line. The maximum floor area ratio in R9A districts is 7.52. On wide streets, the base height is 60 to 105 feet with a maximum building height of 145 feet. On narrow streets, the base height is 60 to 95 feet with a maximum building height of 135 feet. The street wall of a new building on a wide street must extend along the entire width of the zoning lot and at least 70% of the street wall must be within eight feet of the street line on a narrow street. The area between

a building's street wall and the street line must be planted and the building must have interior amenities for residents pursuant to the Quality Housing Program. Typical retail uses included in C2-4 commercial overlay areas include neighborhood grocery stores, restaurants and beauty parlors and may also include uses such as funeral homes and repair services. In mixed residential / commercial buildings, commercial uses are limited to one or two floors and must always be located below the residential use.

8.2.1.2 Applicable Comprehensive Community Master Plans or Land Use Plans

The Special Inwood District, encompassing the Inwood neighborhood, was established in 2018 as part of the Inwood NYC Action Plan to promote the development of affordable housing, encourage economic development that benefits the local community, facilitate the development of open space along the Harlem River and preserve community character west of 10th Avenue. The Special District regulations aim to create walkable inviting streets. The Special District also establishes a Waterfront Action Plan to build out public waterfront open space along the Harlem River. The proposed redevelopment of the Site is consistent with this plan and the current zoning.

8.2.1.3 Surrounding Property Uses

The area surrounding the Site is an urban area comprised primarily of commercial and multi-family residential properties (**Figure 4**). The Site (Block 2203, Lot 21) is adjoined by the following: West 207th Street and the 207th Street Train Yard Facility and a gasoline station across the street to the north, West 206th Street to the south, a 9th Avenue, beyond which is a commercial use building and the Harlem River to the east, and a parking lot and former grocery store (BCP Site #221144), beyond which are residential and commercial use buildings to the west.

Figure presenting the surrounding land use is provided as **Figure 4**.

8.2.1.4 Citizen Participation

Citizen participation will be pursued throughout the remedial process in accordance with the Citizen Participation Plan (CPP) for the Site (**Appendix C**).

8.2.1.5 Environmental Justice Concerns

According to the NYSDEC database for environmental justice concerns, the Site is included as part of the Potential Environmental Justice Areas (PEJAs).

8.2.1.6 Land Use Designations

There are no federal or state land use designations related to the Site.

8.2.1.7 Population Growth Patterns

According to population growth patterns and projections, a potential future redevelopment of the Site into a mixed-use building that provides affordable/market rate residential housing, retail, parking, and community facilities, will be supportive of the growing community.

8.2.1.8 Accessibility to Existing Infrastructure

The Site's location is accessible to existing infrastructure.

8.2.1.9 Proximity to Cultural Resources

The Dyckman Farmhouse, a National Historic Landmark and NYC Landmark, is located on Broadway and West 204th Street, and a Native American burial ground is located on W. 212th Street and Tenth Avenue.

8.2.1.10 Proximity to Natural Resources

The Site is not located in, or adjacent to, regulated wetlands. The Harlem River is located approximately 500 feet to the east of the Site.

8.2.1.11 Groundwater Vulnerability

There are no known wellhead protection areas or specifically designated groundwater recharge areas in the vicinity of the Site. Groundwater flows to the east-southeast toward the Harlem River. Groundwater is not used as a source of drinking water.

8.2.1.12 Proximity to Floodplains

The Site is not located in the 100-year flood zone, but the far eastern portion is located in the or 500-year flood zone.

8.2.1.13 Geography and Geology of the Site

The Site geography, geology and hydrogeology are described in Section 4.1. A groundwater flow map is presented on **Figure 5**.

8.2.1.14 Current Institutional Controls

There are currently no ICs on the property, however, ICs (SMP and Environmental Easement) will be implemented if portions of the Site do not achieve Track 1 as part of the remedial action. A plywood construction fence currently surrounds the Site.

8.3 Summary of Selected Remedial Actions

The elements of the Track 1 Unrestricted Use remedy are:

1. Installation of SOE to reach the proposed remedial excavation depths to meet Track 1 and remove the suspected UST in the northeast portion of the Site.
2. Removal of the suspected UST and any associated petroleum-impacted soil from the northeast portion of the Site.
3. Excavation and off-Site disposal of approximately 6,200 in-place cy of soil (i.e., all soil exceeding UUSCOs) over the entire Site. The limits and approximate depths of remedial excavation are shown on **Figure 6**. This source removal will improve groundwater and soil vapor quality. Final remedial disposal quantities will be based on confirmation endpoint samples and actual truck weights.
4. Collection and analysis of remedial excavation bottom endpoint samples at a frequency of one per 900 square feet to document that the SCOs were met.
5. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the Site.
6. Dewatering, in compliance with city, state, and federal laws and regulations required to meet remedial excavation depths. Extracted groundwater will be treated on-Site under a permit from New York City Department of Environmental Protection to meet pretreatment requirements prior to

discharge to the sewer system. This dewatering will improve groundwater quality and remove a source of petroleum-related soil vapor impacts.

7. As part of the Track 1 remedy, a soil vapor intrusion evaluation will be completed. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion, although based on the RI data collected and the remedial action proposed to reach Track 1 (which will remove all soil that may be a potential on-Site source of soil vapor), there will be no remaining on-Site source of vapor intrusion. In addition, the building's foundation will sit several feet below the water table, therefore there will be no soil vapor beneath the building. As such, this will preclude soil vapor sampling, which is an important component of a soil vapor intrusion evaluation (indoor air sampling alone does not provide the full picture and can be misleading). It will also preclude installation of a sub-slab mitigation system. As part of the building's design, and in line with NYSDEC green remediation principles, a full waterproofing membrane will be installed beneath the slab and up the foundation walls, which will increase the energy efficiency of the building. Considering all of these elements together, once the remedial action and building construction is complete, the potential for soil vapor intrusion will be addressed and will be documented in the FER.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP and the Department-issued Decision Document. All deviations from the RAWP and/or Decision Document will be promptly reported to NYSDEC for approval and fully explained in the FER.

9. Remedial Action Program

9.1 Governing Documents

9.1.1 Site Specific Health and Safety Plan (HASP)

The Site-specific HASP is included in **Appendix D** and the Site-specific CAMP is included within the HASP. All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by the Federal Occupational Safety and Health Administration (OSHA).

The Volunteer and associated parties preparing the remedial documents submitted to the State and those performing the construction work, are completely responsible for the preparation of an appropriate Health and Safety Plan and for the appropriate performance of work according to that plan and applicable laws.

The HASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion.

The Roux Site Safety Coordinator will be determined prior to implementation of the remedial action. A resume will be provided to NYSDEC prior to the start of remedial construction.

Confined space entry will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gasses.

9.1.2 Quality Assurance Project Plan (QAPP)/ Field Sampling Plan (FSP)

The QAPP/FSP (**Appendix E**) includes all procedures to be followed for sampling and analysis. The QAPP/FSP includes all requirements outlined in DER-10 Section 2.4.

9.1.3 Construction Quality Assurance Plan

Quality assurance/quality control procedures for all construction activities associated with implementation of the remedial action construction are established in the Construction Quality Assurance Plan (CQAP), which is included in this section of the RAWP. The CQAP describes the Site-specific construction quality assurance and control measures that will be performed during remediation that will be implemented at the Site during implementation of the RAWP. The CQAP includes a program for construction observation and testing to verify performance of the remedial construction in accordance with the RAWP.

In general, the work to be addressed by this CQAP consists of the excavation and proper management/disposal of impacted soils.

9.1.3.1 Organization/Personnel

The implementation of the remedial action construction will be sequenced based on construction requirements, environmental considerations, and logistic limitations posed by the small size of the Site and proximity of adjacent structures. The project team is comprised of the Owner/Volunteer (Harlem River Ninth Avenue Development LLC), contractors, and consultants specializing in one or more critical aspects of the project. It is understood by the project team that close coordination and proper sequencing of all activities

occurring on the Site will be crucial to the success of the remediation. The project team and associated responsibilities are as follows. If changes are made to the project team, the CQAP will be amended.

Company	Project Role	Name (title)	Contact Info (email or phone)
Harlem River Ninth Avenue Development LLC	Owner/Volunteer	Katherine Kelman (Project Manager)	kkelman@lmdevparners.com (646) 527-7224
Urban Atelier Group (UAG)	General Contractor/Soil Remedial Contractor	Mohamed Mahmoud (Project Quality Control Officer)	mhemida@uag.nyc (347) 599-4128
Roux	Environmental Consultant	Jessica Taylor, P.G. (Project Principal)	jtaylor@rouxinc.com (631) 232-2600
		Noelle Clarke, P.E. (Remedial Engineer)	nclarke@rouxinc.com (631) 232-2600
		Valarie Sabatasso (Project Manager)	vsabatasso@rouxinc.com (631) 232-2600
		TBD (Field Team Leader)	(631) 232-2600
		David Kaiser (Quality Assurance Officer)	dkaiser@rouxinc.com (631) 232-2600
To Be Determined	Surveying Firm	To Be Determined	To Be Determined
Eurofins TestAmerica	Environmental Laboratory	Melissa Haas (Project Manager)	melissa.hass@eurofins.net (203) 308-0880

9.1.3.2 Harlem River Ninth Avenue Development LLC (Owner/Volunteer) – Site Redevelopment and Regulatory Interaction

Katherine Kelman, Redevelopment Project Manager/Remediation Oversight for Owner

As Site owner, Harlem River Ninth Avenue Development LLC's project manager for the Site will coordinate communications with regulatory agencies and will provide general oversight of all aspects of the remediation. Harlem River Ninth Avenue Development LLC will be responsible for the review and submission of all documents, reports, correspondence, etc., required by the RAWP and/or the BCA with the NYSDEC.

Harlem River Ninth Avenue Development LLC's Project Manager will be responsible for community notifications and addressing concerns with the adjacent property owners and local community on all remediation-related issues. Harlem River Ninth Avenue Development LLC will be immediately notified by the on-Site team of any complaints or concerns regarding the work raised by the adjacent property owners and or the general public.

9.1.3.3 General Contractor/Soil Remedial Contractor – UAG

Mohamed Mahmoud, Project Quality Control Officer

The General Contractor will be responsible for the quality assurance of all of the tasks being implemented. The General Contractor will confirm that all components of the Site activities are conducted according to the requirements of the RAWP. The General Contractor will be responsible for verifying that the daily Site construction activities are in compliance with all of the safety requirements and regulations governing the Site activity; however, each subcontractor is responsible for the health and safety of their own personnel. The General Contractor will be responsible for managing the transportation and disposal of any contaminated waste and materials generated during the construction, including:

- Fill/Soil;
- Contaminated Concrete, Bricks or Other Construction Debris;
- Personal Protective Equipment and Other Miscellaneous Debris (If Any); and
- Construction Wastewater (If any).

The soil Remedial Contractor is responsible for the excavation and disposal of portions of the Site to the required depths, construction and demolition debris and all other contaminated wastes generated, transportation and disposal of non-contaminated construction and demolition debris (if any), and decontamination of equipment. The primary environmental obligations of the soil Remedial Contractor include safely managing all excavated materials, preventing the contaminated Site soils from being tracked off-Site, dust/odor control and decontamination equipment, as necessary.

9.1.3.4 Roux Environmental Engineering and Geology, D.P.C. – RAWP and Environmental Monitoring Compliance

Jessica Taylor – Project Principal
Noelle Clarke, P.E. – Remedial Engineer
Valerie Sabatasso –Project Manager
David Kaiser – Quality Assurance Officer
TBD – Field Manager/Site Safety Officer (SSO)

Roux will coordinate all Site activities being implemented to achieve the remedial objectives defined in the RAWP. Roux will provide continual review of all quality control measures implemented by the contractors to ensure compliance with the Site's remedial objectives and the Site-specific HASP. As such, Roux will provide oversight services for the duration of the remedial activities.

Roux will implement the Site-specific CAMP in accordance with the HASP. Roux will provide ambient air quality monitoring for VOCs and particulates during all intrusive Site activities. CAMP monitoring data will be reported daily to the SSO and will be maintained on-Site. Action level exceedances will be reported to the SSO, Harlem River Ninth Avenue Development LLC and General Contractor project managers and appropriate communication (with NYSDEC and NYSDOH) and action taken. All CAMP monitoring records will be included in the overall 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 action limit reports (if any). If an action limit report is generated due to VOC exceedances, the NYSDEC and NYSDOH will be notified within 24 hours of the exceedance. A brief summary of CAMP activities, including any action limit reports generated, will be provided in the daily report.

The Quality Assurance Officer is responsible for conducting reviews, inspections, and audits to ensure the data collection is conducted in accordance with the QAPP/FSP. The Quality Assurance Officer'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 Quality Assurance Officer reports to the Project Manager and makes independent recommendations to the field team.

All on-Site quality control persons identified in the CQAP will provide daily briefings and/or reports to Roux on-Site personnel, identifying the tasks completed, the remedial measures achieved, and any other issues of concern. Additionally, Ms. Noelle M. Clarke, the "Remedial Engineer," a professional engineer licensed in

the State of New York, will be responsible for certifying that the remediation construction was completed in substantial conformance with the approved RAWP and/or any NYSDEC-approved field changes.

9.1.3.5 Environmental Laboratory

The need for an environmental laboratory is specific to soil end-point sampling and clean backfill sampling. The potential also exists for chemical-specific air sampling and analysis, though not currently planned. Eurofins TestAmerica will be utilized for all remediation construction-related analytical requirements. Eurofins TestAmerica is a NYSDOH ELAP certified laboratory. All results will be reported in electronic format deliverables prepared in accordance with NYSDEC requirements. Formal laboratory qualifications and QA/QC information packages for Eurofins TestAmerica and any other analytical laboratories proposed for the project will be submitted to the NYSDEC or disposal facilities, if requested.

9.1.3.6 TBD – Surveying Firm

Personnel to Be Determined, Construction Quality Control

A NYS-licensed surveying firm, will be contracted to provide lines, grades, boundaries, benchmarks, topographic surveys, as-built drawings, and any other survey work required for the proper execution and documentation of the work as required by the RAWP.

9.1.3.7 Waste Disposal Facilities

Waste from the Site will be transported to appropriately permitted waste disposal facilities. The waste disposal facilities selected for this project will be determined once the bidding process is completed.

If any is generated, non-impacted construction debris will be transported to a registered construction and demolition disposal facility.

9.1.3.8 Waste Transporter and Disposal Facility Qualifications

A qualifications package for each vendor contracted to transport waste from the Site to the designated soil disposal facilities and each designated disposal facility will be submitted to NYSDEC. The package will include the following:

- Proof of insurance and all current necessary waste transport permits for the waste type(s) being transported.
- Letters of commitment from all waste haulers and from all transfer, treatment, storage, and disposal facilities to be used for the project. The letters of commitment shall specifically identify the types and quantities of waste that the facility will be able to accept, the permit numbers for all facilities at which the waste will be accepted and all waste characterization requirements, if additional to waste characterization samples already collected. In the event that a facility (such as a privately-owned treatment works) is prohibited from issuing a letter of commitment without a sample of the waste, a conditional-type letter will be acceptable. Such a conditional letter shall specifically state what types and quantities of waste the facility will accept.
    - For each waste hauler:
        - Name and federal and state identification numbers, as applicable;
        - Address;
        - Name of responsible contact for the hauler;
        - Telephone number for the contact;
        - List of types and sizes of all transport vehicles and equipment to be used;

- A description of proposed transportation route, method, and procedures for hauling waste material, including type of vehicles that will be used for each type of waste; and
- Copies of any and all necessary permits and authorizations for each type of waste transported.

- For each transfer, treatment, storage and disposal facility, the Contractor shall submit the following information:
  - Facility name and federal and state identification numbers;
  - Facility location;
  - Name of responsible contact for the facility;
  - Telephone number for contact;
  - Signed letter of agreement to accept waste;
  - Unit of measure utilized at facility for costing purposes; and
  - Copies of all permits, licenses, letters of approval, and other authorizations to operate, held by the proposed facility as they pertain to receipt, and management of waste derived from this Contract.

9.1.3.9 Construction Quality Control Testing

Implementation of quality control testing and measurement will be performed by the contractors conducting the specific Site tasks. The quality control officers, defined in Section 9.1.3.1, will be responsible for providing documentation of all testing and measurement results to Roux. Roux will be responsible for verifying that all quality control testing has been conducted in compliance with the RAWP and as specified herein.

Prior to initial quality control testing procedures:

1. Verify that the testing procedures are within the manufacturer's recommendations.
2. Verify that the facilities' testing equipment are available and comply with testing standards.
3. Check testing instrument calibrations against certified standards.
4. Verify the recording forms, including all the test documentation requirements have been prepared.

Qualifications of all independent environmental testing firms and laboratories will be submitted to Roux and Harlem River Ninth Avenue Development LLC for approval prior to any quality control testing and/or lab analysis as an obligation of this CQAP.

Specific task-driven testing/certification obligations as they relate to environmental aspects of the project are as follows:

- A New York State-licensed surveyor will conduct all of the necessary measurements and provide associated documentation to verify that the excavation limits are achieved.
- Waste characterization was completed in 2021 to supplement the RI samples. The *in situ* characterization sampling and analysis performed will allow the excavated impacted soils to be direct-loaded for waste transport and disposal, to the extent practicable. Waste characterization analysis parameters and frequency for any additional samples were determined by the waste disposal facility's acceptance requirements. Results of the waste characterization program completed to date at the Site will be provided to the disposal facility for review, along with data generated during the SRI.
- The CAMP requires continuous real-time monitoring of VOCs and particulates during all intrusive Site activities. This monitoring equipment will be inspected periodically throughout each day to check

and manually record the concentrations of VOCs and particulates and to ensure that the equipment is working properly. The equipment will be repaired, recalibrated, or replaced, as necessary. The periodic measurements will be used to identify any potential risks of off-Site migration. This monitoring data will be collected and logged for review daily by Roux and made available for regulatory agency review. Action Limit Reports will be completed to document any and all action level exceedances and will be submitted to NYSDEC and NYSDOH, as defined in the CAMP.

- The HASP requires continuous real-time monitoring of VOCs and particulates in the breathing zone of workers that will potentially be exposed to on-Site contaminants during all intrusive Site activities in order to identify and mitigate potential exposure risks to on-Site workers. This monitoring equipment will be inspected periodically throughout each day to ensure that the equipment is working properly. The equipment will be repaired, recalibrated, or replaced, as necessary.
- All testing data will be managed in accordance with the above requirements and will be included in the FER to be prepared by Roux upon completion of all remedial objectives defined in the RAWP.

9.1.3.10 Project Coordination

During implementation of the remedial action construction, progress meetings/conference calls will be conducted periodically to assess the progress of the work, overall progress to date, quality control requirements, environmental and construction health and safety requirements, and future progress expectations. Those in attendance will include representatives from the Volunteer, the General Contractor, Roux, and other subcontractors, as necessary. This will provide the opportunity for all Site tasks to be integrated and discussed collectively and provide for coordination of all Site activities to maintain the overall construction schedule. Routine task meetings will also be conducted on an as-needed basis to insure proper communication between the contractors, tradesman, and supervisory personnel.

9.1.4 Soil/Materials Management Plan (SoMP)

The SoMP is included in Section 10.4 of this RAWP.

9.1.5 Erosion and Sediment Controls

The erosion and sediment controls will be in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control.

As necessary, hay bales will be placed at locations upgradient of excavation areas to control stormwater runoff and surface water from entering or exiting the excavation. Catch basin inlets immediately adjacent to the work area will be protected to prevent disturbed soil from entering. Construction water will be managed in accordance with the SoMP described in section 10.4.

The Site is exempt from the NYSDEC State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-15-002) requirement as it is solely serviced by combined sewers. As such, a stormwater pollution prevention plan (SWPPP) is not required.

Details related to erosion and sediment controls to be followed during construction will be prepared by the Site civil engineer and will be submitted to NYSDEC prior to construction.

9.1.6 Community Air Monitoring Plan (CAMP)

All invasive work will be completed in accordance with the CAMP that is included within the HASP in **Appendix D**.

9.1.7 Contractors Site Operations Plan (SOP)

The Remedial Engineer has reviewed all plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and confirms that they are in compliance with this RAWP. The Remedial Engineer is responsible to ensure that all later document submittals for this remedial project, including contractor and sub-contractor document submittals, are in compliance with this RAWP. All remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

9.1.8 Citizen Participation Plan

No changes will be made to approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing. Fact sheets will be provided in English and Spanish. Fact sheets will be sent electronically by the NYSDEC project manager.

A certification of mailing will be sent by the Volunteer to the NYSDEC project manager following the distribution of all Fact Sheets and notices that includes: (1) certification that the Fact Sheets were mailed, (2) the date they were mailed; (3) a copy of the Fact Sheet; (4) a list of recipients (contact list); and (5) a statement that the repository was inspected on (specific date) and that it contained all of applicable project documents.

The approved Citizen Participation Plan for this project is attached in **Appendix C**.

Document repositories have been established at the following locations and contain all applicable project documents:

Inwood Library
4857 Broadway
New York, NY 10034
Phone: 212-942-2445
Manager, Danita Nichols
E-mail: danitanichols@nypl.org

Manhattan Community Board District 12
Chairperson: Eleazar Bueno
District Manager: Ebenezer Smith
530 West 166th Street, 6th Floor
New York, NY 10032
Phone: (212) 568-8500
Fax: (212) 740-8197
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Access project documents through the DEC info Locator https://www.dec.ny.gov/data/DecDocs/C231147/

9.2 General Remedial Construction Information

9.2.1 Project Organization

A copy of professional profiles for the Project Principal, Remedial Engineer, Quality Assurance Officer, Project Manager, and Field Manager/SSO (resumes are provided for a number of staff that may oversee the field work) for Roux and for the data validator are presented in **Appendix F**.

9.2.2 Remedial Engineer

The Remedial Engineer for this project will be Noelle M. 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 remedial program for the project (NYSDEC BCP Site No. C231147). The Remedial Engineer will certify in the FER that the remedial activities were observed by qualified environmental professionals under her supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

The Remedial Engineer will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of back fill material, and management of waste transport and disposal. The Remedial Engineer will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The Remedial Engineer will review all pre-remedial plans submitted by contractors for compliance with this Remedial Action Work Plan and will certify compliance in the FER.

The Remedial Engineer will provide the certifications listed in Section 14.1 in the FER.

9.2.3 Remedial Action Construction Schedule

A schedule for the major elements of the remedial construction and portions of the redevelopment construction are presented in Section 15.

9.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or according to specific variances issued by that agency. DEC will be notified by the Volunteer of any variances issued by the Department of Buildings. NYSDEC reserves the right to deny alternate remedial construction hours.

9.2.5 Site Security

Security for the work, equipment, materials, supplies, facilities, personnel, and incidentals will be provided throughout the performance of the work at the Site. The Site will be fully fenced with construction fencing conforming to New York City Department of Buildings requirements. This fencing will be maintained throughout the remedial construction work. Temporary fencing and barricades will be used to delineate and secure areas of ongoing remediation activities. Site security personnel will be employed as needed.

9.2.6 Traffic Control

All construction work will occur between 7 A.M. and 6 P.M. from Monday to Friday. The contractors may work longer hours and/or weekends, as permitted by the proper authorities. If work beyond these hours or on weekends is required, the proper authorities will be notified. Disturbances to the local community will be minimized to the extent practical.

For any trucking required, the proposed truck routes for ingress and egress to the Site are shown in **Figure 8**.

All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes. 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, to the extent practicable; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation. A temporary decontamination pad/truck wash will be constructed to decontaminate trucks and other vehicles/equipment leaving the Site.

The contractors operating on the Site will be responsible for providing all necessary personnel and materials (i.e., traffic lanes, safety cones, etc.) to control traffic entering and exiting the Site and for coordinating traffic control measures with the New York City Police Department, as necessary. Contractors operating on the Site shall be responsible for all applicable NYCDOT traffic control and notification requirements and incorporating those elements into this Traffic Control Plan.

9.2.7 Contingency Plan

The Contingency Plan is described in Section 10.4.11.

9.2.8 Worker Training and Monitoring

All general Site workers (as defined in OSHA 1910.120 (e)(3)(i)) that will be involved with earth disturbance activities will have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations (40-Hour HAZWOPER training) and meet the medical surveillance requirements included in the HASP.

9.2.9 Agency Approvals

The Volunteer will address all State Environmental Quality Review Act (SEQRA) requirements for this Site, as appropriate for the future redevelopment. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction.

The potential future end use for the Site is in conformance with the zoning for the property as determined by New York City Department of Planning.

A complete list of all local, regional, and national governmental permits, certificates or other approvals or authorizations required to perform the remedial work is attached in **Table 17**. This list includes a citation of the law, statute, or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the FER.

9.2.10 NYSDEC BCP Signage

A project sign is no longer required for BCP sites.

9.2.11 Pre-Construction Meeting with NYSDEC

A project kick-off meeting will be conducted with the Volunteer, Roux, NYSDEC, the General Contractor and the selected Remedial Contractor prior to the commencement of any intrusive remedial activities proposed in this RAWP.

9.2.12 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in **Table 18**. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency. Since the contractors have not yet been selected, the emergency contact list will be updated prior to the start of work.

9.2.13 Remedial Action Costs

The total cost for Remedial Alternative 1 is estimated to be $4,149,200.

9.3 Site Preparation

9.3.1 Mobilization

Mobilization

The soil contractors shall supply any labor and materials required for the removal and disposal of contaminated soil. Mobilization and Site preparation activities include:

1. Mobilization of equipment to the work area.
2. Installation/maintenance of the perimeter construction fencing, temporary fencing, and traffic barricades to delineate the work zone and act as a work Site security measure. Security personnel will be on-Site as needed.
3. Implementation of erosion and sediment control measures in accordance with the New York Guidelines for Urban Erosion and Sediment Control.
4. Set-up of decontamination facilities.

9.3.2 Erosion and Sedimentation Controls

Implementation of erosion and sediment controls will be in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control. As necessary, hay bales will be placed at locations upgradient of excavation areas to control stormwater runoff and surface water from entering or exiting the excavation. Catch basin inlets immediately adjacent to the work area will be protected to prevent disturbed soil from entering. Construction water will be managed in accordance with the SoMP described in Section 10.4.

9.3.3 Stabilized Construction Entrance(s)

Stabilized construction entrances will be installed at all points of vehicle ingress and egress to the Site. The truck wash/decontamination pad (see Section 9.3.7) and the stone-based egress path (9.3.3) will be continuous so that trucks do not get re-contaminated prior to departure from the Site.

Any soil spilled on the sidewalk or street immediately adjacent to the Site will be promptly removed and the street will be cleaned.

9.3.4 Utility Markout and Easements Layout

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this RAWP is posed by utilities or easements on the Site.

9.3.5 Structural Stability/Support of Excavation

Appropriate management of structural stability of on-Site or off-Site structures during on-Site activities that include excavation is the sole responsibility of the Volunteer and its contractors. SOE has been designed as a critical part of the remedy to reach the required remedial excavation depths and remove the suspected UST in the northeast portion of the Site. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals that may be required to perform work under this RAWP. Further, the Volunteer and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved RAWP.

9.3.6 Equipment and Material Staging

An equipment and materials staging area will be established in a designated area on-Site.

9.3.7 Decontamination Area

A temporary decontamination pad/truck wash will be constructed to decontaminate trucks and other vehicles/equipment leaving the Site. The decontamination pad will be sized to accommodate the largest construction vehicle used and located prior to the stabilized construction egress. The decontamination pad may be integrated with the stabilized construction entrance. Dry decontamination will be employed to the extent practical, within a designated area of the Site. All liquid decontamination material will be collected and properly disposed of off-Site or treated using an on-Site treatment system prior to discharge to the New York City sewer system. The truck decontamination area/construction entrance will be adequately sloped toward the interior of the Site to prevent off-site tracking of soils.9.3.8 Site Fencing and Security

The Site is fully enclosed with NYCDOB-approved construction fencing, which will be maintained during remedial construction. Security personnel will be provided as necessary.

The fences and gates will be closed and locked when there is no activity on the Site and any breaks or gaps will be repaired immediately. Temporary fencing (e.g., cones, caution tape, etc.) will supplement the perimeter fencing to delineate and secure the area of ongoing remediation activities within the Site such as soil stockpiles, and health and safety exclusion zones.

9.3.8 Demobilization

Demobilization from the Site will include:

- Removal and restoration of off-Site equipment and materials storage areas;
- Removal of all temporary fencing and barricades;
- Restoration of disturbed access areas to pre-remediation conditions, as appropriate;
- Removal of sediment and erosion control measures and disposal of materials in accordance with acceptable rules and regulations;
- Equipment decontamination, as required; and
- General refuse disposal.

9.4 Reporting

All daily and monthly Reports will be included in the FER.

9.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by noon of each day following the reporting period and will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- References to alpha-numeric map for Site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP results, including excursions;
- An explanation of notable Site conditions;
- A look ahead portion which describes immediate future work; and
- Photos of site activity.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information. However, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

A Site map for use in identifying locations described in reports submitted to NYSDEC is attached on **Figure 2**.

The NYSDEC assigned project number will appear on all reports.

9.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the 10th of the month following the end of the month of the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e., tons of material exported and imported, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

9.4.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital (JPEG) format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the FER.

Job-Site record keeping for all remedial work will be appropriately documented. These records will be maintained on-Site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

9.4.4 Complaint Management Plan

If an odor or dust complaint is received, the following procedure will be implemented:

1. Work in the affected area will be halted, and the source of odors/dust will be identified.
2. NYSDEC, NYSDOH, and the Volunteer will be notified of the complaint.
3. Nuisance odors, if any, will be abated through covering/containerizing excavated materials, backfilling open excavations in a timely manner; and/or using a foam unit or other appropriate measures.
4. As described in NYSDEC DER10, **Appendix 1B – Fugitive Dust Control**, nuisance dust, if any, will be abated through applying water on haul roads; wetting equipment and excavation faces; spraying water on buckets during excavation and dumping; hauling materials in properly tarped or watertight containers; restricting vehicle speeds to 10 mph; covering excavated areas and material after excavation activity ceases; and reducing the excavation size and/or number of excavations.
5. Work will resume in the affected area when the nuisance odors/dust have been abated, as determined by the Roux on-Site personnel.

9.4.5 Deviations from the Remedial Action Work Plan

Deviations from the RAWP will be reported to NYSDEC for approval and fully explained in the FER.

10. Remedial Action: Material Removal From Site

This section describes material removal from the Site during the remedial action.

It should be noted that a Change of Use (COU) form and associated Excavation Work Plan (EWP) were submitted to NYSDEC on October 27, 2021 regarding the limited excavation for a foundation element required to be completed before June 2022 for 421-a vesting purposes. This limited excavation may occur prior to approval of this RAWP in accordance with the requirements in the EWP as acknowledged by NYSDEC.

10.1 Suspected UST Removal and Soil Excavation

Removal of material from the Site as part of the Remedial Action includes removal of the suspected UST and any associated impacted soil from the northeastern portion of the Site and excavation of all soil exceeding UUSCOs across the Site.

10.1.1 Removal of Suspected UST from the Northeast Portion of the Site

The proposed removal of the suspected UST in the northeastern portion of the Site will entail the following steps as detailed below and is expected to take one day to complete. All work will be conducted in accordance with the Site-Specific Health and Safety Plan and Community Air Monitoring Plan as well as the NYSDEC DER-10 guidance.

- A UST removal notification will be provided to NYSDEC 30 days in advance of the UST removal.
- An excavation/SOE permit will be obtained from the New York City Department of Buildings (NYCDOB).
- Roux will provide NYSDEC with ten calendar days' notice prior to the fieldwork.
- The UST will be uncovered by an excavator. Care will be taken to avoid damaging and/or puncturing the UST.
- A licensed UST removal contractor will perform the following:
    - Any fluids currently in the UST will be extracted using a vacuum truck.
    - The interior of the UST will be rendered inert by degassing.
    - The UST will either be excavated and removed from its current location and placed on plastic and then cut/cleaned, or it will be cut open and cleaned in the location it was found, whichever makes more sense logistically.
    - The UST will be cut into pieces (as necessary) and transported offsite as scrap metal.
    - Roux's oversight personnel will inspect the area beneath and around the UST after it is removed, screen the soil with a photoionization detector [PID] and assess for any evidence of a release from the UST (i.e., odors, visible staining and/or significant total volatile organic compound [VOC] readings on the PID). If there is evidence of a release, Roux will perform soil sampling in accordance with DER-10. Any additional sampling will be completed in accordance with Section 10.2.
    - Any oil or cleaning fluids will be disposed of offsite at an appropriate licensed and permitted facility.
- The tank will be registered with the NYSDEC Petroleum Bulk Storage (PBS) Unit as necessary.

- After removal, an affidavit will be submitted by the contractor to the New York City Fire Department confirming its removal by a licensed contractor.

10.1.2 Soil Excavation

Excavated material slated for off-Site disposal will be direct loaded into trucks for disposal, to the extent practical, or will be temporarily staged on-Site and disposed in accordance with the Soil and Materials Management Plan discussed in Section 10.4.

Following excavation, end-point soil samples will be collected in accordance with the remedial performance evaluation described in Section 10.2.

10.1.3 Soil Cleanup Objectives

The Soil Cleanup Objectives for this Site are listed in **Table 19**. The SCOs for this Site are the UUSCOs. Soil and materials management on-Site and off-Site will be conducted in accordance with the SoMP as described below.

Tables 2 through 7 present all soil samples that exceed the SCOs proposed for this Remedial Action. **Plate 1** shows all soil samples that exceed the SCOs proposed for this Remedial Action.

10.2 Remedial Performance Evaluation (Post Excavation End-Point Sampling)

End-point sampling and reporting will be conducted in accordance with DER-10 and the QAPP and is discussed in the sections below.

A confirmation sample means a sample taken during the course of a remedial action to determine whether cleanup requirements have been achieved or whether further remediation is required.

A documentation sample means a sample taken after remedial action is complete to document the level of contamination remaining.

10.2.1 End-Point Sampling Frequency

Bottom Sampling

Bottom confirmation sampling will be conducted at a frequency of one sample per approximately 900 square feet of excavation area (24 samples total). The frequency of bottom sampling proposed for this alternative is in accordance with the guidance provided in NYSDEC DER-10 5.4. It should be noted that the entire Site will be excavated to elevation -1.5 ft NAVD88 for redevelopment purposes. Therefore, there will be no internal sidewalls between the grids since no soil will remain. In addition, in portions of the Site where the remedial excavation depth is shallower than the final redevelopment excavation depth, the confirmation samples will be collected immediately below the remedial excavation depth. Confirmation samples will be analyzed for the full suite of parameters (VOCs, SVOCs, metals, pesticides/herbicides, PCBs, and ECs). In the event that Track 1 SCOs are not achieved in the areas shown on **Figure 6**, the remedy may default to a Track 2 restricted residential use cleanup in those areas.

Twenty-four bottom confirmation samples (BCS) , listed on **Table 20** and identified as BCS-21-01 through BCS-21-24, will be collected to make up the required frequency across the Site. Samples will be distributed throughout the Site and will be biased toward impacts, if any are observed.

Sidewall Sampling

Sidewall sampling will not be required since Track 1 UUSCOs excavation will extend to the property boundaries.

10.2.2 Methodology

Endpoint samples will be collected in accordance with DER-10 Section 5.4(b), except for the modified frequencies described above. Each sample will be inspected for visual evidence of contamination (i.e., staining, presence of petroleum or odors) and field screened for VOCs using a PID. Soil samples to be submitted for analysis will be placed in a laboratory sample jar, placed in an iced cooler, and transported to the laboratory.

10.2.3 Reporting of Results

The laboratory will report analytical results for endpoint samples in ASP Category B deliverable packages. An EDD in the required NYSDEC format will also be provided by the laboratory.

All end-point sample data generated for the Remedial Action will be logged in a database and organized to facilitate data review and evaluation. The electronic dataset will include the data flags provided in accordance with USEPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analysis and Inorganic Analyses, as well as additional comments of the data review for ASP analyses. The data flags include such items as: 1) concentration below required detection limit; 2) estimated concentration due to poor recovery below required detection limit; 3) estimated concentration due to poor spike recovery; and 4) concentration of chemical also found in laboratory blank.

10.2.4 QA/QC

QA/QC samples serve as checks on both the sampling and measurement systems and assist in determining the overall data quality with regard to representation, accuracy, and precision. The QAPP/FSP, included as Appendix E to this RAWP, describes QA/QC procedures and sampling for the project.

10.2.5 DUSR

A DUSR will be prepared to evaluate the end-point samples by a party independent from the laboratory performing the analysis in accordance with Appendix 2B of DER-10. The QAPP/FSP, included as **Appendix E** to this RAWP, describes the DUSR to be prepared for the project.

10.2.6 Reporting of End-Point Data in FER

Chemical laboratories used for all end-point sample results and contingency sampling will be NYSDOH ELAP certified. End-point sampling frequency is described in Section 10.2.1. The FER will provide a tabular and map summary of all end-point sample results and exceedances of SCOs.

10.3 Estimated Material Removal Quantities

The proposed remedial action includes remedial excavation and off-Site disposal of a total of approximately 6,200 in-place cy of soil across the Site to achieve a Track 1 Unrestricted Use cleanup. The limits and approximate depths of remedial excavation are shown on **Figure 6**. The Site was broken down into 6 three dimensional grids (similar to a Rubix cube) for the purpose of evaluating remedial excavation depths and

determining appropriate waste disposal facilities based on all soil sampling conducted between 2018 and 2021, as described in Section 3.3.

Based on the waste characterization sampling, the soil to be disposed of off-Site will be non-hazardous. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the Site, as necessary. Soil or other suitable material will be imported into the Site for backfill as necessary. Though not currently planned, soil/fill may be reused/relocated on Site, though reuse of soil/fill will depend on construction sequencing. Sampling and requests for soil reuse will be conducted in accordance with NYSDEC requirements if reuse is proposed during the work.

10.4 Soil/Materials Management Plan

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

10.4.1 Soil Screening Methods

Visual, olfactory, and PID soil screening and assessment will be performed by a qualified environmental professional or experienced field geologist under the direction of the Remedial Engineer during all remedial and development excavations into known or potentially contaminated material. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy, prior to issuance of the COC.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the FER.

Screening will be performed by qualified environmental professionals. Resumes will be provided for all personnel responsible for field screening (i.e., those representing the Remedial Engineer) of invasive work for unknown contaminant sources during remediation and development work.

10.4.2 Stockpile Methods

Although direct-loading of trucks will be performed to the extent practical, stockpiles, if any, will be inspected at a minimum once each week 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.

Stockpiles, if any, will always be kept covered with appropriately anchored tarps. Stockpiles will be routinely inspected, and damaged tarp covers will be promptly replaced.

Soil stockpiles, if any, will be continuously encircled with silt fences or hay bales. Hay bales will be used as needed near catch basins and other discharge points.

Water will be available on-Site at suitable supply and pressure for use in dust control.

10.4.3 Materials Excavation and Load Out

The Remedial Engineer or a qualified environmental professional under her supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this RAWP is posed by utilities or easements on the Site.

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

A truck wash will be operated on-Site. The Remedial Engineer or their designated representative will be responsible for ensuring that all outbound trucks will be free of Site soil clinging to their exterior before leaving the Site until the remedial construction is complete.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site sediment tracking.

The Remedial Engineer or their designated representative will be responsible for ensuring that all egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during Site remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site–derived materials.

The Volunteer and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as adjacent building foundations).

The Remedial Engineer will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this RAWP.

If required, each hotspot and structure to be remediated (USTs, vaults and associated piping, transformers, etc.) will be removed and end-point remedial performance sampling completed before excavations related to Site development commence proximal to the hotspot or structure.

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation required by this plan.

Mechanical processing of historical fill and contaminated soil on-Site is prohibited.

All primary contaminant sources (including but not limited to tanks and hotspots, if any) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be reported in the FER.

10.4.4 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.

Truck transport routes are as described in Section 9.2.6. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes.

Proposed in-bound and out-bound truck routes to the Site are shown in Figure 6. These are the most appropriate routes and consider: (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.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site.

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

Off-Site queuing will be minimized to the extent practical.

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

Cleaning of trucks prior to exiting the Site is discussed in Section 9.3.7.

10.4.5 Materials Disposal Off-Site

The disposal locations will be determined prior to implementation of the remedial action and will be reported to the NYSDEC Project Manager.

The total remedial quantity of material expected to be disposed off-Site is approximately 6,200 in-place cy of soil exceeding UUSCOs across the Site.

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.

Material that does not meet Track 1 UUSCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-15 Registration Facility).

The following documentation will be obtained and reported by the Remedial Engineer for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a completed disposal facility application for each receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This application will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The application will provide the project identity. The application 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.

Historical fill and contaminated soils from the Site are prohibited from being disposed at Part 360-15 Registration Facilities (also known as Soil Recycling Facilities).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the Division of Materials Management (DMM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without permit modifications only upon prior notification of NYSDEC Region 2 DMM. This material is prohibited from being sent or redirected to a Part 360-15 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.

The FER will include an accounting of the destination of all material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, urban fill, solid waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will also be presented in a tabular form in the FER.

A Bill of Lading system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the FER.

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

Waste characterization was performed for off-Site disposal in a manner suitable to a variety of common receiving facilities and their applicable permits. Sampling and analytical methods, sampling frequency, and analytical results will be reported in the FER. 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.

10.4.6 Materials Reuse On-Site

Although not planned, on-site soil may be reused for backfill. In the event this occurs, chemical criteria for on-Site reuse of material has been approved by NYSDEC. These criteria are listed in **Table 21**. The Remedial Engineer will ensure that procedures defined for materials reuse in this RAWP are followed and that unacceptable material will not remain on-Site.

A “Request to Import/Reuse Fill Material” form will be filed with the NYSDEC project manager for review and approval prior to material reuse on the site. A copy of the form is presented in **Appendix G**.

Acceptable demolition material proposed for reuse on-Site, if any, will be sampled for asbestos. Concrete crushing or processing on-Site is prohibited.

Contaminated on-Site material, including urban fill and contaminated soil, removed for grading or other purposes will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. This will be expressed in the final Site Management Plan.

10.4.7 Fluids Management

Construction wastewater will be generated from dewatering to reach proposed excavation depths, personnel/equipment decontamination and run-off/run-on in bermed soil stockpile and excavation areas. The wastewater will be sampled and submitted for analysis for disposal/discharge characterization. Based on the laboratory analytical results, the construction wastewater will be discharged (after treatment, if necessary) to the public sewer system, if approved in writing by the NYCDEP.

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported, and disposed in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP.

Dewatered fluids will not be recharged back to the land surface or subsurface of the Site. Dewatering fluids will be managed off-Site.

Discharge of water generated during remedial construction to surface waters will not take place.

10.4.8 Demarcation

A demarcation layer is not required for the proposed remedy.

10.4.9 Backfill from Off-Site Sources

All materials proposed for import onto the Site will be approved by the Remedial Engineer and will be in compliance with provisions in this RAWP prior to receipt at the Site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) and DER-10, section 5.4(e) will be brought in to replace the excavated soil and establish the designed grades at the Site. Any backfill requiring sampling will be analyzed for the full suite of Part 375 parameters and ECs.

Solid waste, material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site. Material from other environmental remediation sites will not be imported to the Site without prior approval of NYSDEC.

The FER will include the following certification by the Remedial Engineer: *"I certify that all import of soils from off-Site, including source evaluation, approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan".*

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 for Track 1 are the UUSCOs and are listed in **Table 21**. Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC. Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose.

Soils that meet 'general' 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 RAWP should be construed as an approval for this purpose.

A "Request to Import/Reuse Fill Material" form will be filed with the NYSDEC project manager for review and approval prior to import to the site. A copy of the form is presented in **Appendix G**.

Backfill material that may be used for this Site includes soil, gravel, or stone.

10.4.10 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed and inspected once a week 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. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

Erosion and sediment control measures identified in the RAWP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Details related to erosion and sediment controls to be followed during construction will be prepared by the Site civil engineer and will be submitted to NYSDEC prior to construction.

10.4.11 Contingency Plan

In the unlikely event that additional underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation, sampling will be performed on product, sediment, and surrounding soils, etc. Chemical analytical work will be for full scan parameters (TAL metals; TCL VOCs and SVOCs, TCL pesticides, PCBs, and ECs). Analyses will not be otherwise limited without NYSDEC approval. Discovery of underground storage tanks will be handled in accordance with NYSDEC DER-10, Section 5.5.

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 and in the FER.

10.4.12 Community Air Monitoring Plan

CAMP will be conducted during any intrusive activities until Track 1 SCOs are met across the Site. The CAMP is included within the HASP in **Appendix D**. A map showing the location of mobile sampling stations will be provided in each daily CAMP report.

Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the daily report.

10.4.13 Odor, Dust and Nuisance Control Plan

The FER will include the following certification by the Remedial Engineer: *"I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan."*

10.4.13.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site and on-Site. Specific odor control methods to be used on a routine basis will include limiting open excavation areas and covering excavated soil (i.e., with polyethylene sheeting or in covered roll off containers). 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. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Volunteer's Remedial Engineer, who is responsible for certifying the FER.

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.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

10.4.13.2 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-Site work, will include, at a minimum, the items listed below and will comply with NYSDEC DER-10 **Appendix 1B – Fugitive Dust Control:**

- Dust suppression will be achieved through applying water on haul roads; wetting equipment and excavation faces; spraying water on buckets during excavation and dumping; hauling materials in properly tarped or watertight containers; restricting vehicle speeds to 10 mph; covering excavated areas and material after excavation activity ceases; and reducing the excavation size and/or number of excavations.
- Clearing and grubbing will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to limit dust generation.

10.4.13.3 Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work and will conform, at a minimum, to NYCDEP noise control standards.

11. Contingency for Remaining Contamination On-Site

Since the goal of the remedial action for this Site is Track 1 unrestricted use, remaining contamination is not anticipated to be present. However, in the unlikely event that Track 1 UUSCOs are not met across all or part of the Site and the remedy may revert to a Track 2 in these areas, ICs are required to protect human health and the environment. These ICs are described hereafter. Long-term management of ICs and of remaining contamination will be implemented under a Site specific SMP that will be developed and approved by NYSDEC. Although soil vapor is not significantly impacted, a soil vapor intrusion evaluation will be completed as part of the remedy.

The FER will report remaining contamination on the Site in tabular and map form. This will include presentation of exceedances of Track 1 (or Track 2) SCOs.

12. Engineering Controls

As a Track 1 unrestricted use remedy (with a fall back to Track 2 restricted residential use) is planned for the Site, Engineering Controls are not required.

13. Contingency for Institutional Controls

In the unlikely event that Track 1 UUSCOs are not met across all or part of the Site, ICs will be implemented for these areas. As a contingency is remaining contamination is present, two elements have been designed to ensure continual and proper management of remaining contamination in perpetuity: an Environmental Easement and a SMP.

A Site-specific Environmental Easement will be recorded with New York County to provide an enforceable means of ensuring the continual and proper management of remaining contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all ICs placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ICs. The SMP describes appropriate methods and procedures to ensure compliance with all ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

13.1 Contingency Environmental Easement

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when remaining contamination is left on-Site after the Remedial Action is complete. If Track 1 is not achieved across the Site, an Environmental Easement approved by NYSDEC will be filed and recorded with the New York County Office of the City Register. If necessary, the recorded Environmental Easement will be submitted as part of the FER.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement:

1. Requires the remedial party or Site owner to complete and submit to the NYSDEC a periodic certification of institutional controls in accordance with Part 375-1.8 (h)(3);
2. Allows the continued use and development of the controlled property for restricted residential (or less restrictive uses) as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
3. Restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or Article 141 of the NYCDOH code; and
4. Requires compliance with the Department approved SMP.

If one is required, the Environmental Easement must be filed with the New York County Office of the City Register before the Certificate of Completion can be issued by NYSDEC. A series of ICs are required under this remedy to prevent future exposure to remaining contamination by controlling disturbances of the subsurface soil and restricting the use of all areas of the Site to restricted residential (and less restrictive uses defined in 6 NYCRR Part 375) use(s) only. These ICs are requirements or restrictions placed on the Controlled Property that are listed in, and required by, the Environmental Easement. ICs can, generally, be subdivided between controls that support ECs, and those that place general restrictions on Site usage or other requirements. ICs in both of these groups are closely integrated with the SMP, which provides all of the methods and procedures to be followed to comply with this remedy.

Adherence to these ICs for the Site is mandated by the Environmental Easement and will be implemented under the SMP (discussed in the next section). The Controlled Property will also have a series of ICs in the form of Site restrictions and requirements. The restrictions that apply to the Controlled Property are:

- Vegetable gardens and farming on the Controlled Property are prohibited, with the exception of raised planters;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Controlled Property that will disturb remaining contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;
- The Controlled Property may be used for restricted residential use (and less restrictive uses defined in 6 NYCRR Part 375) only, provided the ICs included in the SMP are employed;
- The Controlled Property may not be used for a higher level of use, such as residential or unrestricted use without an amendment or extinguishment of this Environmental Easement; and
- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This annual statement must be certified by a QEP or a P.E.

13.2 Contingency Site Management Plan

If Track 1 UUSCOs are not met, Site management for the Controlled Property is the last phase of remediation and begins with the approval of the FER and issuance of the COC for the Remedial Action. A Site Management will be conducted as described below. The SMP will be a complete and independent document. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure all Site Management responsibilities defined in the Environmental Easement and the SMP are performed.

The SMP is intended to provide a detailed description of the procedures required to manage remaining contamination left in place at the Controlled Property following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all ICs; and (2) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC.

A SMP is required for the Controlled Property, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

   i. Institutional Controls: The Environmental Easement discussed in Section 13.1.

   ii. Soil Management Plan: This plan includes, but may not be limited to:

      - an Excavation Plan that details the provisions for management of future excavations in areas of remaining contamination;
      - descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions;

- a provision for evaluation of the potential for soil vapor intrusion for any future buildings on the Site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- maintaining Site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. A Monitoring Plan to assess the performance and effectiveness of the remedy, including, if necessary, monitoring for vapor intrusion for any buildings constructed on the Site.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annually. The first certification will be due 16 months after issuance of the COC and annually (or at another frequency as approved by NYSDEC) thereafter.

No exclusions for handling of remaining contaminated soils will be provided in SMP. All handling of remaining contaminated material will be subject to provisions contained in the SMP.

14. Final Engineering Report

A FER will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides the documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The FER will include as-built drawings for all constructed elements, certifications, manifests, and bills of lading. The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP. The FER will provide a tabular summary of all performance evaluation sampling results and all material characterization results and other sampling and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The FER will be prepared in conformance with DER-10, section 5.8.

The FER will include written and photographic documentation of all remedial work performed under this remedy.

The FER will provide a thorough summary of all remaining contamination left on the Site after the remedy is complete. Remaining contamination includes all contamination that exceeds the Track 1 UUSCOs in 6NYCRR Part 375-6. If Track 1 is not met across the Site, a table that shows exceedances from Track 1 UUSCOs for all soil/fill remaining at the Site after the Remedial Action and a map that shows the location and summarizes exceedances from Track 1 Unrestricted Use SCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

The FER will provide a thorough summary of all remaining contamination that exceeds the SCOs defined for the Site in the RAWP and must provide an explanation for why the material was not removed as part of the Remedial Action. A table that shows remaining contamination in excess of Site SCOs and a map that shows remaining contamination in excess of Site SCOs will be included in the FER.

The FER will include an accounting of the destination of all material removed from the Site, including excavated contaminated soil, urban fill, solid waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the Site.

Before approval of a FER and issuance of a Certificate of Completion, all project reports must be submitted in digital form on electronic media (PDF).

14.1 Certifications

The following certification will appear in front of the Executive Summary of the Final Engineering Report. This certification will be appropriately signed and stamped. The certification will include the following statements:

> *I, Noelle M. Clarke, certify that I am currently a NYS registered professional engineer, I had primary direct responsibility for the implementation of the subject construction program, and I certify that the RAWP was implemented and that all construction activities were completed in substantial conformance with the DER-approved RAWP.*
>
> *The data submitted to DER demonstrates that the remediation requirements set forth in the Remedial Work Plan and all applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, established in the work plan.*

All use restrictions, institutional controls, engineering controls and/or any operation and maintenance requirements applicable to the site are contained in an environmental easement created and recorded pursuant to ECL 71-3605 and that any affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded.

A Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of any engineering controls employed at the site including the proper maintenance of any remaining monitoring wells, and that such plan has been approved by DER.

Where DER has determined that the Site does not represent a significant threat to public health and the environment and where contaminants in groundwater at the site boundary contravene drinking water standards, the following statement will be added to the certification:

No new information has come to the remedial party (site owners) attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of offsite contamination are no longer valid", and

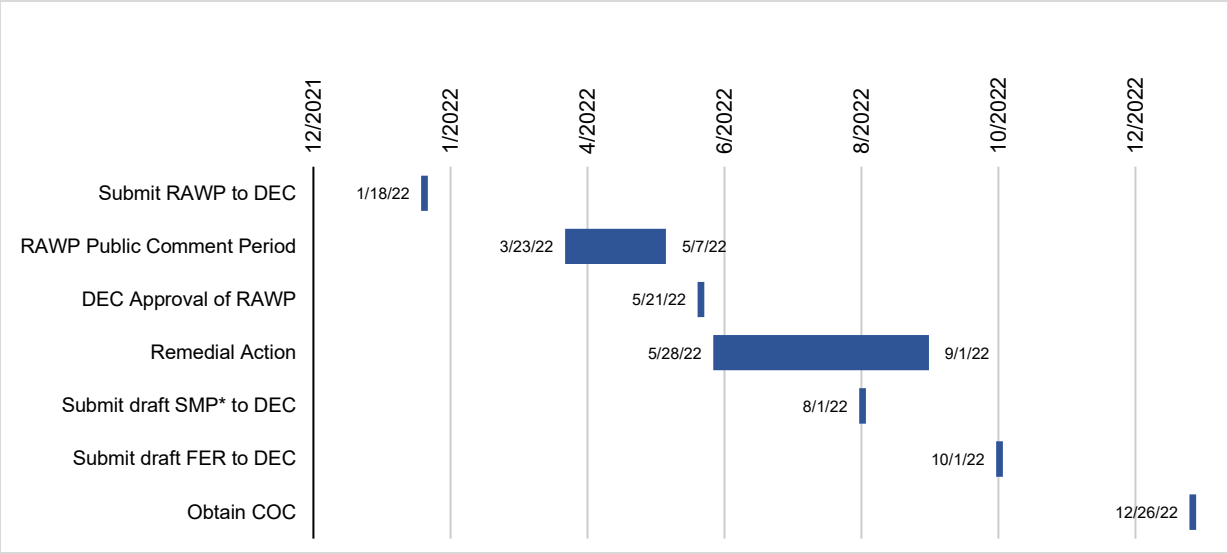
In addition, every five years the following statement (g) will be added to the certification:

"The assumptions made in the qualitative exposure assessment remain valid."

The certification will be signed by the Remedial Engineer, Noelle M. Clarke, who is a Professional Engineer registered in New York State.

15. Schedule

A schedule for the proposed Remedial Action is presented below.



* - a Site Management Plan will be prepared if Track 1 is not achieved.

TABLES

1. Groundwater Gauging Data
2. Summary of VOCs in Soil Samples
3. Summary of SVOCs in Soil Samples
4. Summary of Metals in Soil Samples
5. Summary of PCBs in Soil Samples
6. Summary of Pesticides and Herbicides in Soil Samples
7. Summary of PFAS in Soil Samples
8. Summary of VOCs in Groundwater Samples
9. Summary of SVOCs in Groundwater Samples
10. Summary of Metals in Groundwater Samples
11. Summary of PCBs in Groundwater Samples
12. Summary of Pesticides and Herbicides in Groundwater Samples
13. Summary of Per- and Polyfluoroalkyl Substances in Groundwater
14. Summary of VOCs in Soil Vapor
15. Remedial Alternative 1 Remedial Cost Estimate
16. Remedial Alternative 2 Remedial Cost Estimate
17. List of Required Permits
18. Emergency Contact List
19. Track 1 Soil Cleanup Objectives
20. Proposed Confirmation Soil Sample Identifications and Depths
21. Backfill Soil Cleanup Objectives

Table 1. Summary of Groundwater Gauging Data, 408 West 207th St, New York, NY

Monitoring Well Identification	Gauging Date	Land Surface Elevation (ft NAVD 88)	Top of Casing Elevation (ft NAVD 88)	Depth to Water (ft btoc)	Water Table Elevation (ft NAVD 88)
MW-21-01	11/19/2021	12.01	11.59	9.51	2.08
MW-21-02	11/19/2021	11.41	11.10	8.27	2.83
MW-21-03	11/19/2021	12.23	11.86	8.17	3.69
MW-09-01*	11/19/2021	15.02	14.61	10.53	4.08
MW-09-02*	11/19/2021	14.24	13.99	10.35	3.64
MW-09-03*	11/19/2021	13.49	13.37	9.62	3.75

Notes:
ft - feet
NAVD 88 - North American Vertical Datum of 1988
TOC - top of casing
btoc - below top of casing
* - monitoring wells from adjacent BCP Site C231144 used to prove additional flow data

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
H -	Sample was prepped or analyzed beyond the specified holding time
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
N -	Normal sample
FD -	Duplicate sample
WC -	Waste Characterization sample
NA -	Compound was not analyzed for by laboratory
µg/kg -	Micrograms per kilogram
mg/kg -	Milligrams per kilogram
NYSDEC -	New York State Department of Environmental Conservation
UUSCO -	Unrestricted Use Soil Cleanup Objectives
RRSCO -	Restricted Residential Soil Cleanup Objectives
PGWSCO -	Protection of Groundwater Soil Cleanup Ojectives
SCO -	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	
Red data indicates that parameter was detected above the NYSDEC Part 375 PGWSCO	
Per- and Polyfluoroalkyl Substances	
GV -	Guidance Values
Bold data indicates that parameter exceeded the NYSDEC Unrestricted Use Guidance Values	
Shaded data indicates that parameter exceeded the NYSDEC Restricted Residential Guidance Values	
Red data indicates that parameter exceeded the NYSDEC Protection of Groundwater Guidance Values	
Groundwater Tables	
J -	Estimated Value
U -	Compound was analyzed for but not detected
B -	The analyte was found in an associated blank as well as in the sample
T -	Indicates that a quality control parameter has exceeded laboratory limits
FD -	Duplicate sample
NA -	Compound was not analyzed for by laboratory
µg/L -	Micrograms per liter
ng/L -	Nanogram per liter
NYSDEC -	New York State Department of Environmental Conservation
AWQSGVs -	Ambient Water-Quality Standards and Guidance Values
--	No NYSDEC AWQSGV available

Notes Utilized Throughout Tables
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
Per- and Polyfluoroalkyl Substances
PFAS - Per- and Polyfluoroalkyl Substances
GV - Guidance Values
Bold data indicates that parameter exceeded the NYSDEC October 2021 Proposed PFAS GVs for Human Health
Soil Vapor
J - Estimated value
U - Indicates that the compound was analyzed for but not detected
NA - Compound was not analyzed for by laboratory
FD - Duplicate sample
$\mu g/m^3$ - Micrograms per cubic meter
Bold data indicates that parameter was detected

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	F1	F1	F1	F2	F2	F2	F3	F3	F3	G1	G1	G1	G2	G2
				Sample Date:	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/11/2021	11/11/2021	11/10/2021	11/12/2021
				Sample Depth (ft bls):	0 - 4.5	4.5 - 10.5	10.5 - 16.5	0 - 4	4 - 10	10 - 16	0 - 3.25	3.5 - 9.5	9.5 - 15.5	0 - 3	3 - 9	9 - 15	0 - 3	3 - 9
				Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 UJ	0.26 UJ	0.0015 U	0.0011 U
1,1,2-Trichloroethane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,1-Dichloroethane	0.27	26	0.27	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,1-Dichloroethene	0.33	100	0.33	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,2,4-Trimethylbenzene	**3.6**	52	3.6	mg/kg	0.047	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.073 J	0.0015 U	0.0011 U
1,2-Dibromo-3-Chloropropane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,2-Dichlorobenzene	1.1	100	1.1	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,2-Dichloroethane	0.02	3.1	0.02	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,2-Dichloropropane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	8.4	mg/kg	0.036	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.2 J	0.0015 U	0.0011 U
1,3-Dichlorobenzene	2.4	49	2.4	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,4-Dichlorobenzene	1.8	13	1.8	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	0.0062 U	0.0075 UJ	0.0063 UJ	0.0064 U	0.0068 UJ	0.0069 UJ	0.0084 U	0.0062 UJ	0.0059 UJ	0.0075 U	0.66 U	1.3 U	0.0076 U	0.0054 UJ
Acetone	**0.05**	100	0.05	mg/kg	0.0074 UJ	0.009 U	0.0075 U	0.0076 UJ	0.0082 U	0.01	0.01 UJ	0.0074 U	0.0071 U	0.009 U	0.66 U	1.3 U	0.0091 U	0.013
Acrolein	--	--	--	mg/kg	0.12 U	0.15 U	0.13 U	0.13 U	0.14 U	0.14 U	0.17 U	0.12 U	0.12 U	0.15 U	0.66 U	1.3 U	0.15 U	0.11 U
Acrylonitrile	--	--	--	mg/kg	0.012 U	0.015 U	0.013 U	0.013 U	0.014 U	0.014 U	0.017 U	0.012 U	0.012 U	0.015 U	1.3 U	2.6 U	0.015 U	0.011 U
Benzene	**0.06**	4.8	0.06	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0007 J	0.13 U	0.26 U	0.0015 U	0.0011 U
Bromochloromethane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Bromodichloromethane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Bromoform	--	--	--	mg/kg	0.0012 UJ	0.0015 U	0.0013 U	0.0013 UJ	0.0014 U	0.0014 U	0.0017 UJ	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Bromomethane	--	--	--	mg/kg	0.0025 U	0.003 U	0.0025 U	0.0025 U	0.0027 U	0.0028 U	0.0034 U	0.0025 U	0.0024 U	0.003 U	0.13 U	0.26 U	0.003 U	0.0022 U
Carbon Disulfide	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.00065 J	0.0017 U	0.0012 U	0.0012	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0012
Carbon Tetrachloride	0.76	2.4	0.76	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Chlorobenzene	1.1	100	1.1	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Chloroethane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Chloroform	0.37	49	0.37	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Chloromethane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Cis-1,2-Dichloroethylene	0.25	100	0.25	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Cis-1,3-Dichloropropene	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Cyclohexane	--	--	--	mg/kg	0.016	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.074 J	5.4	0.0015 U	0.0011 U
Dibromochloromethane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Dichlorodifluoromethane	--	--	--	mg/kg	0.0012 UJ	0.0015 U	0.0013 U	0.0013 UJ	0.0014 U	0.0014 U	0.0017 UJ	0.0012 U	0.0012 U	0.0015 UJ	0.13 U	0.26 U	0.0015 U	0.0011 U
Ethylbenzene	**1**	41	1	mg/kg	0.0015	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.052 J	**1.7**	0.0015 U	0.0011 U
Isopropylbenzene (Cumene)	--	--	--	mg/kg	0.0015	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	2.3	24	0.0015 U	0.0011 U
m,p-Xylene	--	--	--	mg/kg	0.024	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Methyl Acetate	--	--	--	mg/kg	0.0062 U	0.0075 U	0.0063 U	0.0064 U	0.0068 U	0.0069 U	0.0084 U	0.0062 U	0.0059 U	0.0075 U	0.66 U	1.3 U	0.0076 U	0.0054 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.12	mg/kg	0.0062 U	0.0075 U	0.0063 U	0.0064 U	0.0068 U	0.0069 U	0.0084 U	0.0062 U	0.0059 U	0.0075 U	0.66 U	1.3 U	0.0076 U	0.0054 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	mg/kg	0.0062 U	0.0075 U	0.0063 U	0.0064 U	0.0068 U	0.0069 U	0.0084 U	0.0062 U	0.0059 U	0.0075 U	0.66 U	1.3 U	0.0076 U	0.0054 U
Methylcyclohexane	--	--	--	mg/kg	0.082	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.00077 J	1.1	48	0.0015 U	0.0011 U
Methylene Chloride	0.05	100	0.05	mg/kg	0.0025 U	0.003 U	0.0025 U	0.0025 U	0.0027 U	0.0028 U	0.0034 U	0.0025 U	0.0024 U	0.003 U	0.13 U	0.26 U	0.003 U	0.0022 U
N-Butylbenzene	**12**	100	12	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	8.5	**30**	0.0015 U	0.0011 U
N-Propylbenzene	**3.9**	100	3.9	mg/kg	0.0027	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	**9.8**	**75**	0.0015 U	0.0011 U

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	F1	F1	F1	F2	F2	F2	F3	F3	F3	G1	G1	G1	G2	G2
				Sample Date:	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/11/2021	11/11/2021	11/10/2021	11/12/2021
				Sample Depth (ft bls):	0 - 4.5	4.5 - 10.5	10.5 - 16.5	0 - 4	4 - 10	10 - 16	0 - 3.25	3.5 - 9.5	9.5 - 15.5	0 - 3	3 - 9	9 - 15	0 - 3	3 - 9
				Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
O-Xylene (1,2-Dimethylbenzene)	--	--	--	mg/kg	0.033	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Sec-Butylbenzene	11	100	11	mg/kg	0.0012	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	2.7	11	0.0015 U	0.0011 U
Styrene	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
T-Butylbenzene	5.9	100	5.9	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.15	0.59	0.0015 U	0.0011 U
Tert-Butyl Alcohol	--	--	--	mg/kg	0.012 U	0.015 U	0.013 U	0.013 U	0.014 U	0.014 U	0.017 U	0.012 U	0.012 U	0.015 U	1.3 U	2.6 U	0.015 U	0.011 U
Tert-Butyl Methyl Ether	0.93	100	0.93	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Tetrachloroethylene (PCE)	1.3	19	1.3	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Toluene	0.7	100	0.7	mg/kg	0.0011 J	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Trans-1,2-Dichloroethene	0.19	100	0.19	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Trans-1,3-Dichloropropene	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Trichloroethylene (TCE)	0.47	21	0.47	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Trichlorofluoromethane	--	--	--	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Vinyl Chloride	0.02	0.9	0.02	mg/kg	0.0012 U	0.0015 U	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0017 U	0.0012 U	0.0012 U	0.0015 U	0.13 U	0.26 U	0.0015 U	0.0011 U
Xylenes	**0.26**	100	1.6	mg/kg	0.058	0.003 U	0.0025 U	0.0025 U	0.0027 U	0.0028 U	0.0034 U	0.0025 U	0.0024 U	0.003 U	0.27 U	0.51 U	0.003 U	0.0022 U

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Sample Designation:					G2	G3	G3	G3	MR-11	MR-11	MR-9	MR-9	RX-1	RX-1	RX-1	RX-1	RX-2	RX-2
Sample Date:					11/12/2021	11/09/2021	11/11/2021	11/11/2021	07/23/2018	07/23/2018	07/26/2018	07/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018
Sample Depth (ft bls):					9 - 15	0 - 2.5	2.5 - 8.5	8.5 - 14.5	0.25 - 0.75	5 - 6.5	1 - 1.5	8 - 9	0.5 - 2.5	5 - 7	8 - 10	13.5 - 15.5	0.5 - 2.5	10 - 12
Normal Sample or Field Duplicate:					N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 UJ	0.1 U	0.11 UJ	0.0014 U	0.1 UJ
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 UJ	0.001 UJ	0.11 U	0.095 UJ	0.1 U	0.11 UJ	0.0014 U	0.1 UJ
1,1,2-Trichloroethane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,1-Dichloroethane	0.27	26	0.27	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,1-Dichloroethene	0.33	100	0.33	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.00037 J	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,2,4-Trimethylbenzene	**3.6**	52	3.6	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	1	0.07 J	**82 J**	1.1	0.0018	0.05 J
1,2-Dibromo-3-Chloropropane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,2-Dichlorobenzene	1.1	100	1.1	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,2-Dichloroethane	0.02	3.1	0.02	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0004 J	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,2-Dichloropropane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	8.4	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.41	0.095 U	0.45	0.11 U	0.00042 J	1.2
1,3-Dichlorobenzene	2.4	49	2.4	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,4-Dichlorobenzene	1.8	13	1.8	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	NA	NA	NA	NA	0.021 U	0.022 UJ	0.024 U	0.02 U	5.3 U	4.8 U	5.2 U	5.5 U	0.029 U	5.1 U
2-Hexanone	--	--	--	mg/kg	0.0061 UJ	0.0095 U	0.0055 U	0.0064 U	0.0054 U	0.0055 U	0.0061 U	0.005 U	0.53 U	0.48 U	0.52 U	0.55 U	0.0072 U	0.51 U
Acetone	**0.05**	100	0.05	mg/kg	0.021	0.011 UJ	0.0066 U	0.0076 U	0.0054 U	0.0066	0.014	0.023	0.53 U	0.48 U	0.52 U	0.55 U	0.039	0.51 U
Acrolein	--	--	--	mg/kg	0.12 U	0.19 U	0.11 U	0.13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg	0.012 U	0.019 U	0.011 U	0.013 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	**0.06**	4.8	0.06	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0018	0.0012 U	0.001 U	**0.45**	0.095 U	0.1 U	0.11 U	0.0098	0.047 J
Bromochloromethane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Bromodichloromethane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Bromoform	--	--	--	mg/kg	0.0012 U	0.0019 UJ	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 UJ	0.1 U	0.11 UJ	0.0014 U	0.1 UJ
Bromomethane	--	--	--	mg/kg	0.0025 U	0.0038 U	0.0022 U	0.0025 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 UT	0.1 U	0.11 UT	0.0014 U	0.1 UT
Carbon Disulfide	--	--	--	mg/kg	0.0019	0.0019 U	0.0011 U	0.00047 J	0.0011 U	0.0011 U	0.0012 U	0.00074 J	0.11 U	0.095 UJ	0.1 U	0.11 UJ	0.0019	0.1 UJ
Carbon Tetrachloride	0.76	2.4	0.76	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 UJ	0.1 U	0.11 UJ	0.0014 U	0.1 UJ
Chlorobenzene	1.1	100	1.1	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Chloroethane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 UJ	0.1 U	0.11 UJ	0.0014 U	0.1 UJ
Chloroform	0.37	49	0.37	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.00057 J	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Chloromethane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 UJ	0.1 U	0.11 UJ	0.0014 U	0.1 UJ
Cis-1,2-Dichloroethylene	0.25	100	0.25	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Cis-1,3-Dichloropropene	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Cyclohexane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.053 J	0.1 U	0.47	0.0014 U	11
Dibromochloromethane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Dichlorodifluoromethane	--	--	--	mg/kg	0.0012 U	0.0019 UJ	0.0011 UJ	0.0013 UJ	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Ethylbenzene	**1**	41	1	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.00071 J	0.0012 U	0.001 U	**6.4**	0.12	**1.1**	0.14	0.0037	**1.1**
Isopropylbenzene (Cumene)	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	1.9	0.71	7	1.4	0.003	13
m,p-Xylene	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.00036 J	0.0016	0.0012 U	0.001 U	2.4	0.22	0.11	0.11 U	0.0066	0.058 J
Methyl Acetate	--	--	--	mg/kg	0.0061 U	0.0095 U	0.0055 U	0.0064 U	0.0054 U	0.0055 U	0.0061 U	0.005 U	0.53 U	0.089 J	0.52 U	0.55 U	0.0072 U	0.51 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.12	mg/kg	0.0061 U	0.0095 U	0.0055 U	0.0064 U	0.0054 U	0.0055 U	0.0061 U	0.0043 J	0.53 U	0.48 U	0.52 U	0.55 U	0.009	0.51 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	mg/kg	0.0061 U	0.0095 U	0.0055 U	0.0064 U	0.0054 U	0.0055 U	0.0061 U	0.005 U	0.53 U	0.48 U	0.52 U	0.55 U	0.0072 U	0.51 U
Methylcyclohexane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	5.9	0.33 J	2.8	2.4 J	0.0014 U	33 J
Methylene Chloride	0.05	100	0.05	mg/kg	0.0025 U	0.0038 U	0.0022 U	0.0025 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
N-Butylbenzene	**12**	100	12	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	4.5	1.3	**14**	2.3	0.0075	**16**
N-Propylbenzene	**3.9**	100	3.9	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	**4.4**	2	**19**	3.9	0.0089	**43**

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	G2	G3	G3	G3	MR-11	MR-11	MR-9	MR-9	RX-1	RX-1	RX-1	RX-1	RX-2	RX-2
				Sample Date:	11/12/2021	11/09/2021	11/11/2021	11/11/2021	07/23/2018	07/23/2018	07/26/2018	07/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018
				Sample Depth (ft bls):	9 - 15	0 - 2.5	2.5 - 8.5	8.5 - 14.5	0.25 - 0.75	5 - 6.5	1 - 1.5	8 - 9	0.5 - 2.5	5 - 7	8 - 10	13.5 - 15.5	0.5 - 2.5	10 - 12
				Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
O-Xylene (1,2-Dimethylbenzene)	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.00026 J	0.00072 J	0.0012 U	0.001 U	0.3	0.037 J	0.1 U	0.11 U	0.0005 J	0.1 U
Sec-Butylbenzene	11	100	11	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	1.8	0.61	4.6	0.76	0.0095	5.4
Styrene	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
T-Butylbenzene	5.9	100	5.9	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.25	0.067 J	0.48	0.066 J	0.0012 J	0.25
Tert-Butyl Alcohol	--	--	--	mg/kg	0.012 U	0.019 U	0.011 U	0.013 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tert-Butyl Methyl Ether	0.93	100	0.93	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Tetrachloroethylene (PCE)	1.3	19	1.3	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Toluene	0.7	100	0.7	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0038	0.0012 U	0.0022	0.22	0.15	0.1 U	0.11 U	0.0025	0.1 U
Trans-1,2-Dichloroethene	0.19	100	0.19	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Trans-1,3-Dichloropropene	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Trichloroethylene (TCE)	0.47	21	0.47	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Trichlorofluoromethane	--	--	--	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 UJ	0.1 U	0.11 UJ	0.0014 U	0.1 UJ
Vinyl Chloride	0.02	0.9	0.02	mg/kg	0.0012 U	0.0019 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0012 U	0.001 U	0.11 U	0.095 U	0.1 U	0.11 U	0.0014 U	0.1 U
Xylenes	**0.26**	100	1.6	mg/kg	0.0025 U	0.0038 U	0.0022 U	0.0025 U	0.00062 J	0.0023	0.0024 U	0.002 U	**2.7**	0.26	0.11 J	0.22 U	0.0071	0.058 J

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	RX-26	RX-26	RX-27	RX-27	RX-27	RX-28	RX-28	RX-29	RX-29	RX-29	RX-3	RX-3	RX-3	RX-5
				Sample Date:	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	09/27/2018	09/27/2018	09/27/2018	09/27/2018
				Sample Depth (ft bls):	3 - 5	5 - 7	3 - 5	7 - 9	12 - 14	0 - 2	5 - 7	0 - 2	5 - 7	5 - 7	0.5 - 2.5	0.5 - 2.5	8 - 10	0.5 - 2.5
				Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,1,2-Trichloroethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,1-Dichloroethane	0.27	26	0.27	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,1-Dichloroethene	0.33	100	0.33	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,2,4-Trimethylbenzene	**3.6**	52	3.6	mg/kg	0.0014 U	0.00099 U	0.00088 J	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.00024 J	0.0011 U
1,2-Dibromo-3-Chloropropane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,2-Dichlorobenzene	1.1	100	1.1	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,2-Dichloroethane	0.02	3.1	0.02	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,2-Dichloropropane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	8.4	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,3-Dichlorobenzene	2.4	49	2.4	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,4-Dichlorobenzene	1.8	13	1.8	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	0.028 UJ	0.02 UJ	0.029 UJ	0.025 U	0.02 UJ	0.026 UJ	0.025 UJ	0.032 UJ	0.024 UJ	0.02 UJ	0.027 U	0.025 U	0.022 U	0.021 U
2-Hexanone	--	--	--	mg/kg	0.0071 U	0.0049 U	0.0073 U	0.0061 U	0.0051 U	0.0064 U	0.0063 U	0.0079 U	0.0061 U	0.005 U	0.0067 U	0.0063 U	0.0054 U	0.0053 U
Acetone	**0.05**	100	0.05	mg/kg	0.0085 U	0.0059 U	0.04	0.043	0.022	0.0077 U	0.0075 U	0.016	0.0073 U	0.006 U	0.017	0.013	0.028	0.018
Acrolein	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	**0.06**	4.8	0.06	mg/kg	0.0014 U	0.00099 U	0.00057 J	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.00044 J	0.0011 U
Bromochloromethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Bromodichloromethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Bromoform	--	--	--	mg/kg	0.0014 UJ	0.00099 UJ	0.0015 UJ	0.0012 U	0.001 UJ	0.0013 UJ	0.0013 UJ	0.0016 UJ	0.0012 UJ	0.00099 UJ	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Bromomethane	--	--	--	mg/kg	0.0028 U	0.002 U	0.0029 U	0.0025 U	0.002 U	0.0026 U	0.0025 U	0.0032 U	0.0024 U	0.002 U	0.0013 U	0.0013 U	0.0011 UJ	0.0011 U
Carbon Disulfide	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0019	0.0006 J	0.00055 J	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0019	0.0011 U
Carbon Tetrachloride	0.76	2.4	0.76	mg/kg	0.0014 UJ	0.00099 UJ	0.0015 UJ	0.0012 UJ	0.001 UJ	0.0013 UJ	0.0013 UJ	0.0016 UJ	0.0012 UJ	0.00099 UJ	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Chlorobenzene	1.1	100	1.1	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Chloroethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 UJ	0.0011 U
Chloroform	0.37	49	0.37	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Chloromethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Cis-1,2-Dichloroethylene	0.25	100	0.25	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Cis-1,3-Dichloropropene	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Cyclohexane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Dibromochloromethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Dichlorodifluoromethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 UJ	0.0013 UJ	0.0011 U	0.0011 UJ
Ethylbenzene	**1**	41	1	mg/kg	0.00054 J	0.00099 U	0.00053 J	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.00034 J	0.0011 U
Isopropylbenzene (Cumene)	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.00074 J	0.0011 U
m,p-Xylene	--	--	--	mg/kg	0.0027	0.00099 U	0.0011 J	0.0012 U	0.001 U	0.0012 J	0.0013 U	0.00043 J	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Methyl Acetate	--	--	--	mg/kg	0.0071 U	0.0049 U	0.0073 U	0.0061 UJ	0.0051 U	0.0064 U	0.0063 U	0.0079 U	0.0061 U	0.005 U	0.0067 U	0.0063 U	0.0054 U	0.0053 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.12	mg/kg	0.0071 U	0.0049 U	0.0073 U	0.0067	0.0051 U	0.0064 U	0.0063 U	0.0079 U	0.0061 U	0.005 U	0.0033 J	0.0024 J	0.0049 J	0.0023 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	mg/kg	0.0071 U	0.0049 U	0.0073 U	0.0061 U	0.0051 U	0.0064 U	0.0063 U	0.0079 U	0.0061 U	0.005 U	0.0067 U	0.0063 U	0.0054 U	0.0053 U
Methylcyclohexane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0047	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Methylene Chloride	0.05	100	0.05	mg/kg	0.0028 U	0.002 U	0.0029 U	0.0025 U	0.002 U	0.0026 U	0.0025 U	0.0032 U	0.0024 U	0.002 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
N-Butylbenzene	**12**	100	12	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
N-Propylbenzene	**3.9**	100	3.9	mg/kg	0.0014 U	0.00099 U	0.00045 J	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011	0.0011 U

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	RX-26	RX-26	RX-27	RX-27	RX-27	RX-28	RX-28	RX-29	RX-29	RX-29	RX-3	RX-3	RX-3	RX-5
				Sample Date:	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	09/27/2018	09/27/2018	09/27/2018	09/27/2018
				Sample Depth (ft bls):	3 - 5	5 - 7	3 - 5	7 - 9	12 - 14	0 - 2	5 - 7	0 - 2	5 - 7	5 - 7	0.5 - 2.5	0.5 - 2.5	8 - 10	0.5 - 2.5
				Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
O-Xylene (1,2-Dimethylbenzene)	--	--	--	mg/kg	0.0015	0.00099 U	0.001 J	0.0012 U	0.001 U	0.00062 J	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.00017 J	0.0011 U
Sec-Butylbenzene	11	100	11	mg/kg	0.0014 U	0.00099 U	0.00063 J	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Styrene	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.00046 J	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
T-Butylbenzene	5.9	100	5.9	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.00043 J	0.0011 U
Tert-Butyl Alcohol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tert-Butyl Methyl Ether	0.93	100	0.93	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Tetrachloroethylene (PCE)	1.3	19	1.3	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Toluene	0.7	100	0.7	mg/kg	0.0014 U	0.00099 U	0.00077 J	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Trans-1,2-Dichloroethene	0.19	100	0.19	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Trans-1,3-Dichloropropene	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Trichloroethylene (TCE)	0.47	21	0.47	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 UJ	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Trichlorofluoromethane	--	--	--	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 U	0.0011 U
Vinyl Chloride	0.02	0.9	0.02	mg/kg	0.0014 U	0.00099 U	0.0015 U	0.0012 U	0.001 U	0.0013 U	0.0013 U	0.0016 U	0.0012 U	0.00099 U	0.0013 U	0.0013 U	0.0011 UJ	0.0011 U
Xylenes	**0.26**	100	1.6	mg/kg	0.0043	0.002 U	0.0021 J	0.0025 U	0.002 U	0.0018 J	0.0025 U	0.0032 U	0.0024 U	0.002 U	0.0027 U	0.0025 U	0.0005 J	0.0021 U

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	RX-5	RX-8	RX-8	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-02	SB-21-02	SB-21-02	SB-21-02	SB-21-03
				Sample Date:	09/27/2018	09/27/2018	09/27/2018	11/10/2021	11/10/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/10/2021
				Sample Depth (ft bls):	5 - 7	0.5 - 2.5	8 - 10	2 - 4	4 - 6	6 - 8	10 - 12	13 - 15	15 - 17	4 - 6	6 - 8	8 - 10	8 - 10	0 - 2
				Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 UJ	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 UJ	0.0011 UJ	0.0021 UJ
1,1,2-Trichloroethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,1-Dichloroethane	0.27	26	0.27	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 U
1,1-Dichloroethene	0.33	100	0.33	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,2,3-Trichlorobenzene	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,2,4-Trichlorobenzene	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,2,4-Trimethylbenzene	**3.6**	52	3.6	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.00047 J	0.049 J	0.066 J	0.00044 J	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,2-Dibromo-3-Chloropropane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 UT	0.0014 UT	0.0012 U	0.0011 U	0.0021 UJ
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,2-Dichlorobenzene	1.1	100	1.1	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,2-Dichloroethane	0.02	3.1	0.02	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,2-Dichloropropane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	8.4	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.13 J	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,3-Dichlorobenzene	2.4	49	2.4	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,4-Dichlorobenzene	1.8	13	1.8	mg/kg	0.001 UJ	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	0.021 U	0.022 U	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	0.0052 U	0.0054 U	0.0051 U	0.0097 U	0.0078 U	0.63 U	0.56 UJ	0.006 U	0.0056 U	0.011 U	0.0071 U	0.0058 U	0.0057 U	0.01 UJ
Acetone	**0.05**	100	0.05	mg/kg	0.0052 U	0.0095	0.014	0.012 U	0.022	0.63 U	0.56 UJ	0.021	0.009 J	0.013 U	0.0085 U	0.0069 U	0.0069 U	0.012 U
Acrolein	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	**0.06**	4.8	0.06	mg/kg	0.001 U	0.0011 U	0.001 U	0.0021	0.0019	0.13 U	0.11 UJ	0.0016	0.00077 J	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0018 J
Bromochloromethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Bromodichloromethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Bromoform	--	--	--	mg/kg	0.001 UJ	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 UJ	0.0011 UJ	0.0021 U
Bromomethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0039 U	0.0031 U	0.13 U	0.11 UJ	0.0024 U	0.0022 U	0.0044 UJ	0.0028 UJ	0.0023 UJ	0.0023 UJ	0.0041 U
Carbon Disulfide	--	--	--	mg/kg	0.001 U	0.0011 U	0.00067 J	0.001 J	0.0024	0.13 U	0.11 UJ	0.00064 J	0.0071	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Carbon Tetrachloride	0.76	2.4	0.76	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 U
Chlorobenzene	1.1	100	1.1	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Chloroethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 UJ	0.0011 UJ	0.0021 U
Chloroform	0.37	49	0.37	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Chloromethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 U
Cis-1,2-Dichloroethylene	0.25	100	0.25	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Cis-1,3-Dichloropropene	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Cyclohexane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.00095 J	0.0016 U	0.13 U	2.5 J	0.0032 J	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Dibromochloromethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 U
Dichlorodifluoromethane	--	--	--	mg/kg	0.001 UJ	0.0011 UJ	0.001 UJ	0.0019 UJ	0.0016 UJ	0.13 U	0.11 UJ	0.0012 UJ	0.0011 UJ	0.0022 UJ	0.0014 UJ	0.0012 U	0.0011 U	0.0021 UJ
Ethylbenzene	**1**	41	1	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.00063 J	0.13 U	0.94 J	0.00051 J	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Isopropylbenzene (Cumene)	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.00076 J	0.0018	1.2	16 J	0.025	0.00038 J	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
m,p-Xylene	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.00094 J	0.0018	0.13 U	0.099 J	0.0013	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Methyl Acetate	--	--	--	mg/kg	0.0052 U	0.0054 U	0.0051 U	0.0097 U	0.0078 U	0.63 U	0.56 UJ	0.006 UJ	0.0056 UJ	0.011 U	0.0071 U	0.0058 UJ	0.0057 UJ	0.01 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.12	mg/kg	0.0052 U	0.0024 J	0.0024 J	0.0097 U	0.0056 J	0.63 U	0.56 UJ	0.0033 J	0.0056 UJ	0.011 U	0.0071 U	0.0058 UJ	0.0057 UJ	0.01 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	mg/kg	0.0052 U	0.0054 U	0.0051 U	0.0097 U	0.0078 U	0.63 U	0.56 UJ	0.006 U	0.0056 U	0.011 U	0.0071 U	0.0058 U	0.0057 U	0.01 UJ
Methylcyclohexane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0041	0.0026	0.42	23 J	0.013	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Methylene Chloride	0.05	100	0.05	mg/kg	0.001 U	0.0011 U	0.001 U	0.0039 U	0.0031 U	0.13 U	0.11 UJ	0.0024 U	0.0022 U	0.0044 U	0.0028 U	0.0023 U	0.0023 U	0.0041 UJ
N-Butylbenzene	**12**	100	12	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0011 J	4.6	**29 J**	0.0056	0.00048 J	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
N-Propylbenzene	**3.9**	100	3.9	mg/kg	0.001 U	0.0011 U	0.001 U	0.0017 J	0.0064	**5.2**	**54 J**	0.042	0.00086 J	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	RX-5	RX-8	RX-8	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-02	SB-21-02	SB-21-02	SB-21-02	SB-21-03
				Sample Date:	09/27/2018	09/27/2018	09/27/2018	11/10/2021	11/10/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/10/2021
				Sample Depth (ft bls):	5 - 7	0.5 - 2.5	8 - 10	2 - 4	4 - 6	6 - 8	10 - 12	13 - 15	15 - 17	4 - 6	6 - 8	8 - 10	8 - 10	0 - 2
				Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
O-Xylene (1,2-Dimethylbenzene)	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.00028 J	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Sec-Butylbenzene	11	100	11	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0012 J	1.5	10 J	0.004	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Styrene	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
T-Butylbenzene	5.9	100	5.9	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.087 J	0.53 J	0.00049 J	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Tert-Butyl Alcohol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tert-Butyl Methyl Ether	0.93	100	0.93	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Tetrachloroethylene (PCE)	1.3	19	1.3	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Toluene	0.7	100	0.7	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.00062 J	0.13 U	0.11 UJ	0.0004 J	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Trans-1,2-Dichloroethene	0.19	100	0.19	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Trans-1,3-Dichloropropene	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 UJ
Trichloroethylene (TCE)	0.47	21	0.47	mg/kg	0.001	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 U
Trichlorofluoromethane	--	--	--	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 U	0.0011 U	0.0021 U
Vinyl Chloride	0.02	0.9	0.02	mg/kg	0.001 U	0.0011 U	0.001 U	0.0019 U	0.0016 U	0.13 U	0.11 UJ	0.0012 U	0.0011 U	0.0022 U	0.0014 U	0.0012 UJ	0.0011 UJ	0.0021 U
Xylenes	**0.26**	100	1.6	mg/kg	0.0021 U	0.0022 U	0.002 U	0.0039 U	0.0018 J	0.25 U	0.099 J	0.0016 J	0.0022 U	0.0044 U	0.0028 U	0.0023 U	0.0023 U	0.0041 UJ

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	SB-21-03	SB-21-03	SB-21-03	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-05	SB-21-05	SB-21-05	SB-21-06	SB-21-06	SB-21-06
Sample Date:					11/11/2021	11/11/2021	11/11/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/10/2021	11/10/2021	11/10/2021
Sample Depth (ft bls):					3 - 5	5 - 7	7 - 9	0 - 2	0 - 2	4 - 6	6 - 8	8 - 10	4 - 6	6 - 8	8 - 10	0 - 2	2 - 4	2 - 4
Normal Sample or Field Duplicate:					N	N	N	N	FD	N	N	N	N	N	N	N	N	FD
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	mg/kg	0.0024 UJ	0.0013 UJ	0.0013 UJ	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,1,2-Trichloroethane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,1-Dichloroethane	0.27	26	0.27	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,1-Dichloroethene	0.33	100	0.33	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,2,4-Trimethylbenzene	**3.6**	52	3.6	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.00033 J	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,2-Dibromo-3-Chloropropane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,2-Dichlorobenzene	1.1	100	1.1	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,2-Dichloroethane	0.02	3.1	0.02	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,2-Dichloropropane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	8.4	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0015	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,3-Dichlorobenzene	2.4	49	2.4	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,4-Dichlorobenzene	1.8	13	1.8	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	0.012 U	0.0067 U	0.0067 U	0.0083 U	0.0086 U	0.0068 UJ	0.0096 UJ	0.007 UJ	0.0045 UJ	0.007 UJ	0.0083 UJ	0.01 U	0.0078 U	0.009 U
Acetone	**0.05**	100	0.05	mg/kg	0.014 U	0.008 U	0.008 U	0.0099 UJ	0.01 UJ	0.0082 UJ	0.012 UJ	0.0085 UJ	0.0054 UJ	0.0084 UJ	0.0099 UJ	0.012 U	0.0094 U	0.011 U
Acrolein	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	**0.06**	4.8	0.06	mg/kg	0.0011 J	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Bromochloromethane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Bromodichloromethane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Bromoform	--	--	--	mg/kg	0.0024 UJ	0.0013 UJ	0.0013 UJ	0.0017 UJ	0.0017 UJ	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Bromomethane	--	--	--	mg/kg	0.0048 UJ	0.0027 UJ	0.0027 UJ	0.0033 U	0.0034 U	0.0027 U	0.0038 U	0.0028 U	0.0018 U	0.0028 U	0.0033 U	0.0041 U	0.0031 U	0.0036 U
Carbon Disulfide	--	--	--	mg/kg	0.00069 J	0.0063	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Carbon Tetrachloride	0.76	2.4	0.76	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Chlorobenzene	1.1	100	1.1	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Chloroethane	--	--	--	mg/kg	0.0024 UJ	0.0013 UJ	0.0013 UJ	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Chloroform	0.37	49	0.37	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Chloromethane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Cis-1,2-Dichloroethylene	0.25	100	0.25	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Cis-1,3-Dichloropropene	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Cyclohexane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Dibromochloromethane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Dichlorodifluoromethane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 UJ	0.0017 UJ	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 UJ	0.0016 UJ	0.0018 UJ
Ethylbenzene	**1**	41	1	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Isopropylbenzene (Cumene)	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
m,p-Xylene	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Methyl Acetate	--	--	--	mg/kg	0.012 UJ	0.0067 UJ	0.0067 UJ	0.0083 U	0.0086 U	0.0068 U	0.0096 U	0.007 U	0.0045 U	0.007 U	0.0083 U	0.01 U	0.0078 U	0.009 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.12	mg/kg	0.012 UJ	0.0067 UJ	0.0067 UJ	0.0083 U	0.0086 U	0.0068 U	0.0096 U	0.007 U	0.0045 U	0.007 U	0.0083 U	0.01 U	0.0078 U	0.009 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	mg/kg	0.012 U	0.0067 U	0.0067 U	0.0083 U	0.0086 U	0.0068 U	0.0096 U	0.007 U	0.0045 U	0.007 U	0.0083 U	0.01 U	0.0078 U	0.009 U
Methylcyclohexane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.00088 J	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Methylene Chloride	0.05	100	0.05	mg/kg	0.0048 U	0.0027 U	0.0027 U	0.0033 U	0.0034 U	0.0027 U	0.0038 U	0.0028 U	0.0018 U	0.0028 U	0.0033 U	0.0041 U	0.0031 U	0.0036 U
N-Butylbenzene	**12**	100	12	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
N-Propylbenzene	**3.9**	100	3.9	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	SB-21-03	SB-21-03	SB-21-03	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-05	SB-21-05	SB-21-05	SB-21-06	SB-21-06	SB-21-06
				Sample Date:	11/11/2021	11/11/2021	11/11/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/10/2021	11/10/2021	11/10/2021
				Sample Depth (ft bls):	3 - 5	5 - 7	7 - 9	0 - 2	0 - 2	4 - 6	6 - 8	8 - 10	4 - 6	6 - 8	8 - 10	0 - 2	2 - 4	2 - 4
				Normal Sample or Field Duplicate:	N	N	N	N	FD	N	N	N	N	N	N	N	N	FD
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
O-Xylene (1,2-Dimethylbenzene)	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.00062 J	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Sec-Butylbenzene	11	100	11	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Styrene	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
T-Butylbenzene	5.9	100	5.9	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Tert-Butyl Alcohol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tert-Butyl Methyl Ether	0.93	100	0.93	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Tetrachloroethylene (PCE)	1.3	19	1.3	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Toluene	0.7	100	0.7	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Trans-1,2-Dichloroethene	0.19	100	0.19	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Trans-1,3-Dichloropropene	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Trichloroethylene (TCE)	0.47	21	0.47	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Trichlorofluoromethane	--	--	--	mg/kg	0.0024 U	0.0013 U	0.0013 U	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Vinyl Chloride	0.02	0.9	0.02	mg/kg	0.0024 UJ	0.0013 UJ	0.0013 UJ	0.0017 U	0.0017 U	0.0014 U	0.0019 U	0.0014 U	0.0009 U	0.0014 U	0.0017 U	0.002 U	0.0016 U	0.0018 U
Xylenes	**0.26**	100	1.6	mg/kg	0.0048 U	0.0027 U	0.0027 U	0.0033 U	0.0034 U	0.0027 U	0.0038 U	0.0028 U	0.00062 J	0.0028 U	0.0033 U	0.0041 U	0.0031 U	0.0036 U

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	SB-21-06	SB-21-06	SB-21-07	SB-21-07	SB-21-07	SB-21-07	SB-21-08	SB-21-08	SB-21-08	SB-21-08	SB-21-09	SB-21-09	SB-21-09	SB-21-09
Sample Date:					11/10/2021	11/12/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/12/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021
Sample Depth (ft bls):					4 - 6	6 - 8	0 - 2	2 - 4	4 - 6	6 - 8	0 - 2	3 - 5	5 - 7	7 - 9	0 - 2	4 - 6	6 - 8	8 - 10
Normal Sample or Field Duplicate:					N	N	N	N	N	N	N	N	N	N	N	N	N	N
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,1,2-Trichloroethane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,1-Dichloroethane	0.27	26	0.27	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 U	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,1-Dichloroethene	0.33	100	0.33	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,2,4-Trimethylbenzene	**3.6**	52	3.6	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,2-Dibromo-3-Chloropropane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,2-Dichlorobenzene	1.1	100	1.1	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,2-Dichloroethane	0.02	3.1	0.02	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 U	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,2-Dichloropropane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	8.4	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,3-Dichlorobenzene	2.4	49	2.4	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,4-Dichlorobenzene	1.8	13	1.8	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	0.0093 U	0.0068 UJ	0.009 U	0.0096 U	0.0075 UJ	0.0063 UJ	0.0093 UJ	0.0062 UJ	0.0071 UJ	0.0057 UJ	0.012 U	0.0062 UJ	0.014 UJ	0.0063 UJ
Acetone	**0.05**	100	0.05	mg/kg	**0.08**	0.015 J	0.011 UJ	0.016 J	0.009 UJ	0.0076 UJ	0.011 U	0.012 J	0.0089 J	0.0069 UJ	0.014 UJ	0.0074 UJ	0.017 UJ	0.0075 UJ
Acrolein	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	**0.06**	4.8	0.06	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Bromochloromethane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Bromodichloromethane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Bromoform	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 UJ	0.0015 U	0.0013 U	0.0019 U	0.0012 U	0.0014 U	0.0011 U	0.0023 UJ	0.0012 U	0.0028 U	0.0013 U
Bromomethane	--	--	--	mg/kg	0.0037 U	0.0027 U	0.0036 U	0.0038 U	0.003 U	0.0025 U	0.0037 U	0.0025 U	0.0028 U	0.0023 U	0.0046 U	0.0025 U	0.0056 U	0.0025 U
Carbon Disulfide	--	--	--	mg/kg	0.00087 J	0.0017	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Carbon Tetrachloride	0.76	2.4	0.76	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Chlorobenzene	1.1	100	1.1	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Chloroethane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 U	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Chloroform	0.37	49	0.37	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Chloromethane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 U	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Cis-1,2-Dichloroethylene	0.25	100	0.25	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Cis-1,3-Dichloropropene	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Cyclohexane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Dibromochloromethane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Dichlorodifluoromethane	--	--	--	mg/kg	0.0019 UJ	0.0014 U	0.0018 UJ	0.0019 UJ	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 UJ	0.0012 U	0.0028 U	0.0013 U
Ethylbenzene	**1**	41	1	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Isopropylbenzene (Cumene)	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
m,p-Xylene	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.00043 J	0.00027 J	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Methyl Acetate	--	--	--	mg/kg	0.0093 U	0.0068 U	0.009 U	0.0096 U	0.0075 U	0.0063 U	0.0093 U	0.0062 U	0.0071 U	0.0057 U	0.012 U	0.0062 U	0.014 U	0.0063 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.12	mg/kg	0.019	0.0068 U	0.009 U	0.0096 U	0.0075 U	0.0063 U	0.0093 U	0.0062 U	0.0071 U	0.0057 U	0.012 U	0.0062 U	0.014 U	0.0063 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	mg/kg	0.0093 U	0.0068 U	0.009 U	0.0096 U	0.0075 U	0.0063 U	0.0093 UJ	0.0062 U	0.0071 U	0.0057 U	0.012 U	0.0062 U	0.014 U	0.0063 U
Methylcyclohexane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Methylene Chloride	0.05	100	0.05	mg/kg	0.0037 U	0.0027 U	0.0036 U	0.0038 U	0.003 U	0.0025 U	0.0037 U	0.0025 U	0.0028 U	0.0023 U	0.0046 U	0.0025 U	0.0056 U	0.0025 U
N-Butylbenzene	**12**	100	12	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
N-Propylbenzene	**3.9**	100	3.9	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U

Table 2. Summary of Volatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	SB-21-06	SB-21-06	SB-21-07	SB-21-07	SB-21-07	SB-21-07	SB-21-08	SB-21-08	SB-21-08	SB-21-08	SB-21-09	SB-21-09	SB-21-09	SB-21-09
				Sample Date:	11/10/2021	11/12/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/12/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021
				Sample Depth (ft bls):	4 - 6	6 - 8	0 - 2	2 - 4	4 - 6	6 - 8	0 - 2	3 - 5	5 - 7	7 - 9	0 - 2	4 - 6	6 - 8	8 - 10
				Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
O-Xylene (1,2-Dimethylbenzene)	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.00039 J	0.00037 J	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Sec-Butylbenzene	11	100	11	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Styrene	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
T-Butylbenzene	5.9	100	5.9	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Tert-Butyl Alcohol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tert-Butyl Methyl Ether	0.93	100	0.93	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 U	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Tetrachloroethylene (PCE)	1.3	19	1.3	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Toluene	0.7	100	0.7	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Trans-1,2-Dichloroethene	0.19	100	0.19	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Trans-1,3-Dichloropropene	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Trichloroethylene (TCE)	0.47	21	0.47	mg/kg	0.0019 U	0.0014 U	0.0018 UJ	0.0019 U	0.0015 U	0.0013 U	0.0019 UJ	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Trichlorofluoromethane	--	--	--	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 U	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Vinyl Chloride	0.02	0.9	0.02	mg/kg	0.0019 U	0.0014 U	0.0018 U	0.0019 U	0.0015 U	0.0013 U	0.0019 U	0.0012 U	0.0014 U	0.0011 U	0.0023 U	0.0012 U	0.0028 U	0.0013 U
Xylenes	**0.26**	100	1.6	mg/kg	0.0037 U	0.0027 U	0.0036 UJ	0.0038 U	0.003 U	0.0025 U	0.0037 UJ	0.00082 J	0.0028 U	0.0023 U	0.0046 U	0.0025 U	0.0056 U	0.0025 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	F1	F1	F2	F2	F2	F3	F3	F3	G1	G1	G1	G2	G2
					Sample Date:	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/11/2021	11/11/2021	11/10/2021	11/12/2021
					Sample Depth (ft bls):	0 - 4.5	4.5 - 10.5	10.5 - 16.5	0 - 4	4 - 10	10 - 16	0 - 3.25	3.5 - 9.5	9.5 - 15.5	0 - 3	3 - 9	9 - 15	0 - 3	3 - 9
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg		0.17 U	0.035 UT	0.035 UT	0.18 U	0.035 UT	0.042 UT	0.037 U	0.037 UT	0.041 UT	0.036 UT	0.036 U	0.04 U	0.037 UT	0.037 UT
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
2,4,5-Trichlorophenol	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
2,4,6-Trichlorophenol	--	--	--	mg/kg		0.7 U	0.14 U	0.14 U	0.73 U	0.14 U	0.17 U	0.15 U	0.15 U	0.17 U	0.14 U	0.15 U	0.16 U	0.15 U	0.15 U
2,4-Dichlorophenol	--	--	--	mg/kg		0.7 U	0.14 U	0.14 U	0.73 U	0.14 U	0.17 U	0.15 U	0.15 U	0.17 U	0.14 U	0.15 U	0.16 U	0.15 U	0.15 U
2,4-Dimethylphenol	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
2,4-Dinitrophenol	--	--	--	mg/kg		1.4 U	0.28 U	0.28 U	1.5 U	0.28 U	0.34 U	0.3 U	0.3 U	0.33 U	0.29 U	0.29 U	0.32 U	0.3 U	0.29 U
2,4-Dinitrotoluene	--	--	--	mg/kg		0.35 U	0.071 U	0.071 U	0.37 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U
2,6-Dinitrotoluene	--	--	--	mg/kg		0.35 U	0.071 U	0.071 U	0.37 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U
2-Chloronaphthalene	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
2-Chlorophenol	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
2-Methylnaphthalene	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.028 J	0.37 U	0.41 U	0.36 U	0.11 J	0.81	0.023 J	0.37 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
2-Nitroaniline	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 UJ	0.4 UJ	0.37 U	0.37 U
2-Nitrophenol	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg		0.7 UT	0.14 U	0.14 U	0.73 UT	0.14 U	0.17 U	0.15 UT	0.15 U	0.17 U	0.14 UT	0.15 U	0.16 U	0.15 UT	0.15 U
3-Nitroaniline	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
4,6-Dinitro-2-Methylphenol	--	--	--	mg/kg		1.4 U	0.28 U	0.28 U	1.5 U	0.28 U	0.34 U	0.3 U	0.3 U	0.33 U	0.29 U	0.29 U	0.32 U	0.3 U	0.29 U
4-Bromophenyl Phenyl Ether	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
4-Chloro-3-Methylphenol	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
4-Chloroaniline	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
4-Chlorophenyl Phenyl Ether	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
4-Nitroaniline	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
4-Nitrophenol	--	--	--	mg/kg		3.5 U	0.71 U	0.71 U	3.7 U	0.71 U	0.85 U	0.75 U	0.75 U	0.83 U	0.73 U	0.74 U	0.8 U	0.75 U	0.74 U
Acenaphthene	20	100	98	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.014 J	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.014 J	0.37 U
Acenaphthylene	100	100	107	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.099 J	0.37 U	0.41 U	0.0074 J	0.36 U	0.4 U	0.058 J	0.37 U
Acetophenone	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Anthracene	100	100	1000	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.095 J	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.062 J	0.37 U
Atrazine	--	--	--	mg/kg		0.7 U	0.14 U	0.14 U	0.73 U	0.14 U	0.17 U	0.15 U	0.15 U	0.17 U	0.14 U	0.15 U	0.16 U	0.15 U	0.15 U
Benzaldehyde	--	--	--	mg/kg		1.7 UJ	0.35 UJ	0.35 UJ	1.8 UJ	0.35 UJ	0.42 UJ	0.37 UJ	0.37 UJ	0.41 UJ	0.36 UJ	0.36 UJ	0.4 UJ	0.37 UJ	0.37 UJ
Benzidine	--	--	--	mg/kg		1.7 UT	0.35 U	0.35 U	1.8 UT	0.35 U	0.42 U	0.37 UT	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Benzo(A)Anthracene	**1**	1	1	mg/kg		0.22	0.036	0.035 U	0.19	0.035 U	0.042 U	0.39	0.037 U	0.041 U	0.061	0.024 J	0.04 U	0.32	0.037 U
Benzo(A)Pyrene	**1**	1	22	mg/kg		0.18	0.026 J	0.035 U	0.19	0.035 U	0.042 U	0.45	0.037 U	0.041 U	0.061	0.015 J	0.04 UJ	0.39	0.037 U
Benzo(B)Fluoranthene	**1**	1	1.7	mg/kg		0.28	0.038	0.035 U	0.22	0.035 U	0.042 U	0.54	0.037 U	0.041 U	0.11	0.018 J	0.04 U	0.52	0.037 U
Benzo(G,H,I)Perylene	100	100	1000	mg/kg		0.12 J	0.014 J	0.35 U	0.11 J	0.35 U	0.42 U	0.32 J	0.37 U	0.41 U	0.066 J	0.016 J	0.4 U	0.21 J	0.37 U
Benzo(K)Fluoranthene	0.8	3.9	1.7	mg/kg		0.098 J	0.015 J	0.035 U	0.11 J	0.035 U	0.042 U	0.21	0.037 U	0.041 U	0.038	0.0092 J	0.04 U	0.18	0.037 U
Benzyl Butyl Phthalate	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Biphenyl (Diphenyl)	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.0085 J	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Bis(2-Chloroethoxy) Methane	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	mg/kg		0.17 U	0.035 U	0.035 U	0.18 U	0.035 U	0.042 U	0.037 U	0.037 U	0.041 U	0.036 U	0.036 U	0.04 U	0.037 U	0.037 U
Bis(2-Chloroisopropyl) Ether	--	--	--	mg/kg		1.7 UJ	0.35 U	0.35 U	1.8 UJ	0.35 U	0.42 U	0.37 UJ	0.37 U	0.41 U	0.36 U	0.36 UJ	0.4 UJ	0.37 U	0.37 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.037 J	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Caprolactam	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Carbazole	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.028 J	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.021 J	0.37 U
Chrysene	**1**	3.9	1	mg/kg		0.19 J	0.035 J	0.35 U	0.17 J	0.35 U	0.42 U	0.36 J	0.37 U	0.41 U	0.067 J	0.017 J	0.4 UJ	0.33 J	0.37 U
Cresols, M & P	0.33	100	0.33	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	F1	F1	F2	F2	F2	F3	F3	F3	G1	G1	G1	G2	G2
					Sample Date:	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/11/2021	11/11/2021	11/10/2021	11/12/2021
					Sample Depth (ft bls):	0 - 4.5	4.5 - 10.5	10.5 - 16.5	0 - 4	4 - 10	10 - 16	0 - 3.25	3.5 - 9.5	9.5 - 15.5	0 - 3	3 - 9	9 - 15	0 - 3	3 - 9
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Dibenz(A,H)Anthracene	0.33	0.33	1000	mg/kg		0.17 U	0.035 U	0.035 U	0.18 U	0.035 U	0.042 U	0.057	0.037 U	0.041 U	0.018 J	0.036 U	0.04 U	0.07	0.037 U
Dibenzofuran	7	59	210	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.027 J	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.015 J	0.37 U
Diethyl Phthalate	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Dimethyl Phthalate	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Di-N-Butyl Phthalate	--	--	--	mg/kg		0.073 J	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.045 J	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.019 J	0.37 U
Di-N-Octylphthalate	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Fluoranthene	100	100	1000	mg/kg		0.28 J	0.04 J	0.35 U	0.3 J	0.35 U	0.42 U	0.75	0.37 U	0.41 U	0.069 J	0.027 J	0.4 U	0.51	0.37 U
Fluorene	30	100	386	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.045 J	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.018 J	0.37 U
Hexachlorobenzene	0.33	1.2	3.2	mg/kg		0.17 U	0.035 U	0.035 U	0.18 U	0.035 U	0.042 U	0.037 U	0.037 U	0.041 U	0.036 U	0.036 U	0.04 U	0.037 U	0.037 U
Hexachlorobutadiene	--	--	--	mg/kg		0.35 U	0.071 U	0.071 U	0.37 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U
Hexachlorocyclopentadiene	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Hexachloroethane	--	--	--	mg/kg		0.17 U	0.035 U	0.035 U	0.18 U	0.035 U	0.042 U	0.037 U	0.037 U	0.041 U	0.036 U	0.036 U	0.04 U	0.037 U	0.037 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	0.5	8.2	mg/kg		0.12 J	0.02 J	0.035 U	0.12 J	0.035 U	0.042 U	0.32	0.037 U	0.041 U	0.053	0.016 J	0.04 U	0.25	0.037 U
Isophorone	--	--	--	mg/kg		0.7 U	0.14 U	0.14 U	0.73 U	0.14 U	0.17 U	0.15 U	0.15 U	0.17 U	0.14 U	0.15 U	0.16 U	0.15 U	0.15 U
Naphthalene	12	100	12	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.08 J	0.37 U	0.41 U	0.019 J	0.15 J	0.6	0.033 J	0.37 U
Nitrobenzene	--	--	--	mg/kg		0.17 U	0.035 U	0.035 U	0.18 U	0.035 U	0.042 U	0.037 U	0.037 U	0.041 U	0.036 U	0.036 U	0.04 U	0.037 U	0.037 U
N-Nitrosodimethylamine	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
N-Nitrosodi-N-Propylamine	--	--	--	mg/kg		0.17 U	0.035 U	0.035 U	0.18 U	0.035 U	0.042 U	0.037 U	0.037 U	0.041 U	0.036 U	0.036 U	0.04 U	0.037 U	0.037 U
N-Nitrosodiphenylamine	--	--	--	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Pentachlorophenol	0.8	6.7	0.8	mg/kg		1.4 U	0.28 U	0.28 U	1.5 U	0.28 U	0.34 U	0.3 U	0.3 U	0.33 U	0.29 U	0.29 U	0.32 U	0.3 U	0.29 U
Phenanthrene	100	100	1000	mg/kg		0.089 J	0.35 U	0.35 U	0.15 J	0.35 U	0.0075 J	0.37	0.37 U	0.41 U	0.032 J	0.022 J	0.014 J	0.22 J	0.37 U
Phenol	0.33	100	0.33	mg/kg		1.7 U	0.35 U	0.35 U	1.8 U	0.35 U	0.42 U	0.37 U	0.37 U	0.41 U	0.36 U	0.36 U	0.4 U	0.37 U	0.37 U
Pyrene	100	100	1000	mg/kg		0.24 J	0.038 J	0.35 U	0.28 J	0.35 U	0.42 U	0.77	0.37 U	0.41 U	0.077 J	0.025 J	0.4 U	0.5	0.37 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation: G2	G3	G3	G3	MR-11	MR-11	MR-9	MR-9	RX-1	RX-1	RX-1	RX-2	RX-2	RX-26
					Sample Date: 11/12/2021	11/09/2021	11/11/2021	11/11/2021	07/23/2018	07/23/2018	07/26/2018	07/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018	01/12/2021
					Sample Depth (ft bls): 9 - 15	0 - 2.5	2.5 - 8.5	8.5 - 14.5	0.25 - 0.75	5 - 6.5	1 - 1.5	8 - 9	0.5 - 2.5	8 - 10	13.5 - 15.5	0.5 - 2.5	10 - 12	3 - 5
					Normal Sample or Field Duplicate: N	N	N	N	N	N	N	N	N	N	N	N	N	N
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	0.038 UT	0.19 U	0.035 U	0.041 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
2,4,5-Trichlorophenol	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
2,4,6-Trichlorophenol	--	--	--	mg/kg	0.15 U	0.76 U	0.14 U	0.16 U	0.16 U	0.16 U	0.15 U	0.14 U	0.14 U	0.31 U	0.16 U	0.2 U	0.16 U	0.16 U
2,4-Dichlorophenol	--	--	--	mg/kg	0.15 U	0.76 U	0.14 U	0.16 U	0.16 U	0.16 U	0.15 U	0.14 U	0.14 U	0.31 U	0.16 U	0.2 U	0.16 U	0.16 U
2,4-Dimethylphenol	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
2,4-Dinitrophenol	--	--	--	mg/kg	0.31 U	1.5 U	0.28 U	0.33 U	0.32 U	0.31 U	0.3 U	0.29 U	0.29 U	0.62 U	0.33 U	0.41 U	0.32 U	0.32 U
2,4-Dinitrotoluene	--	--	--	mg/kg	0.077 U	0.39 U	0.071 U	0.083 U	0.08 U	0.079 U	0.075 U	0.072 U	0.072 U	0.16 U	0.082 U	0.1 U	0.081 U	0.081 U
2,6-Dinitrotoluene	--	--	--	mg/kg	0.077 U	0.39 U	0.071 U	0.083 U	0.08 U	0.079 U	0.075 U	0.072 U	0.072 U	0.16 U	0.082 U	0.1 U	0.081 U	0.081 U
2-Chloronaphthalene	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
2-Chlorophenol	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
2-Methylnaphthalene	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.029 J	0.39 U	0.034 J	0.35 U	2.1	9.7	0.66	0.16 J	4.2	0.012 J
2-Methylphenol (O-Cresol)	0.33	100	0.33	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 UT	0.39 UT	0.37 UT	0.35 UT	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
2-Nitroaniline	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 UJ	0.4 UJ	0.39 UJ	0.37 UJ	0.35 UJ	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
2-Nitrophenol	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg	0.15 U	0.76 UT	0.14 U	0.16 U	0.16 U	0.16 U	0.15 U	0.14 U	0.14 U	0.31 U	0.16 U	0.2 U	0.16 U	0.16 U
3-Nitroaniline	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 UJ	0.35 UJ	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
4,6-Dinitro-2-Methylphenol	--	--	--	mg/kg	0.31 U	1.5 U	0.28 U	0.33 U	0.32 U	0.31 U	0.3 U	0.29 U	0.29 U	0.62 U	0.33 U	0.41 U	0.32 U	0.32 U
4-Bromophenyl Phenyl Ether	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
4-Chloro-3-Methylphenol	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 UJ	0.35 UJ	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
4-Chloroaniline	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
4-Chlorophenyl Phenyl Ether	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 UJ	0.35 UJ	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
4-Nitroaniline	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
4-Nitrophenol	--	--	--	mg/kg	0.77 U	3.9 U	0.71 U	0.83 U	0.8 U	0.79 U	0.75 U	0.72 U	0.72 U	1.6 U	0.82 U	1 U	0.81 U	0.81 U
Acenaphthene	20	100	98	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Acenaphthylene	100	100	107	mg/kg	0.38 U	1.9 U	0.0042 J	0.41 U	0.4 U	0.011 J	0.044 J	0.35 U	0.01 J	0.77 U	0.4 U	0.5 U	0.011 J	0.4 U
Acetophenone	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.073 J	0.39 U	0.013 J	0.35 U	0.36 U	0.77 U	0.4 U	0.1 J	0.4 U	0.4 U
Anthracene	100	100	1000	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.023 J	0.39 U	0.045 J	0.35 U	0.014 J	0.77 U	0.4 U	0.5 U	0.0071 J	0.4 U
Atrazine	--	--	--	mg/kg	0.15 U	0.76 U	0.14 U	0.16 U	0.16 U	0.16 U	0.15 U	0.14 U	0.14 U	0.31 U	0.16 U	0.2 U	0.16 U	0.16 U
Benzaldehyde	--	--	--	mg/kg	0.38 UJ	1.9 UJ	0.35 UJ	0.41 UJ	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 UJ
Benzidine	--	--	--	mg/kg	0.38 U	1.9 UT	0.35 U	0.41 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Anthracene	**1**	1	1	mg/kg	0.038 U	0.19 U	0.029 J	0.041 U	0.027 J	0.038 J	0.25	0.035 U	0.078	0.077 U	0.04 U	0.05 U	0.015 J	0.078
Benzo(A)Pyrene	**1**	1	22	mg/kg	0.038 U	0.053 J	0.026 J	0.041 UJ	0.025 J	0.041	0.31	0.024 J	0.11	0.077 U	0.04 U	0.05 U	0.04 U	0.11 J
Benzo(B)Fluoranthene	**1**	1	1.7	mg/kg	0.038 U	0.088 J	0.033 J	0.041 U	0.039 J	0.052	0.45	0.045	0.15	0.077 U	0.04 U	0.018 J	0.04 U	0.12
Benzo(G,H,I)Perylene	100	100	1000	mg/kg	0.38 U	1.9 U	0.029 J	0.41 U	0.11 J	0.028 J	0.17 J	0.031 J	0.1 J	0.77 U	0.4 U	0.5 U	0.4 U	0.13 J
Benzo(K)Fluoranthene	0.8	3.9	1.7	mg/kg	0.038 U	0.19 U	0.012 J	0.041 U	0.015 J	0.026 J	0.17	0.035 U	0.054	0.077 U	0.04 U	0.05 U	0.04 U	0.044
Benzyl Butyl Phthalate	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 UJ	0.35 UJ	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Biphenyl (Diphenyl)	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.027 J	0.12 J	0.4 U	0.5 U	0.04 J	0.4 U
Bis(2-Chloroethoxy) Methane	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 UT	0.39 UT	0.37 UJ	0.35 UJ	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 UJ
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	mg/kg	0.038 U	0.19 U	0.035 U	0.041 U	0.04 UT	0.039 UT	0.037 UJ	0.035 UJ	0.036 U	0.077 U	0.04 U	0.05 U	0.04 U	0.04 U
Bis(2-Chloroisopropyl) Ether	--	--	--	mg/kg	0.38 U	1.9 UJ	0.35 U	0.41 UJ	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.41	0.12 J	0.26 J	1	0.068 J	0.77 U	0.4 U	0.5 U	0.4 U	0.031 J
Caprolactam	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Carbazole	--	--	--	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.028 J	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Chrysene	**1**	3.9	1	mg/kg	0.38 U	0.065 J	0.033 J	0.41 UJ	0.037 J	0.045 J	0.28 J	0.35 U	0.12 J	0.77 U	0.4 U	0.02 J	0.0073 J	0.084 J
Cresols, M & P	0.33	100	0.33	mg/kg	0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 UT	0.35 UT	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	G2	G3	G3	G3	MR-11	MR-11	MR-9	MR-9	RX-1	RX-1	RX-1	RX-2	RX-2	RX-26
					Sample Date:	11/12/2021	11/09/2021	11/11/2021	11/11/2021	07/23/2018	07/23/2018	07/26/2018	07/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018	01/12/2021
					Sample Depth (ft bls):	9 - 15	0 - 2.5	2.5 - 8.5	8.5 - 14.5	0.25 - 0.75	5 - 6.5	1 - 1.5	8 - 9	0.5 - 2.5	8 - 10	13.5 - 15.5	0.5 - 2.5	10 - 12	3 - 5
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Dibenz(A,H)Anthracene	0.33	0.33	1000	mg/kg		0.038 U	0.19 U	0.035 U	0.041 U	0.04 U	0.039 U	0.053	0.035 U	0.026 J	0.077 U	0.04 U	0.05 U	0.04 U	0.03 J
Dibenzofuran	7	59	210	mg/kg		0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.0077 J	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Diethyl Phthalate	--	--	--	mg/kg		0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Dimethyl Phthalate	--	--	--	mg/kg		0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Di-N-Butyl Phthalate	--	--	--	mg/kg		0.38 U	0.077 J	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Di-N-Octylphthalate	--	--	--	mg/kg		0.38 U	1.9 U	0.35 U	0.41 U	0.4 UJ	0.39 UJ	0.37 UJ	0.35 UJ	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Fluoranthene	100	100	1000	mg/kg		0.38 U	0.095 J	0.037 J	0.41 U	0.028 J	0.037 J	0.34 J	0.028 J	0.16 J	0.014 J	0.011 J	0.023 J	0.018 J	0.11 J
Fluorene	30	100	386	mg/kg		0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.012 J	0.35 U	0.021 J	0.039 J	0.0091 J	0.014 J	0.033 J	0.4 U
Hexachlorobenzene	0.33	1.2	3.2	mg/kg		0.038 U	0.19 U	0.035 U	0.041 U	0.04 U	0.039 U	0.037 U	0.035 U	0.036 U	0.077 U	0.04 U	0.05 U	0.04 U	0.04 U
Hexachlorobutadiene	--	--	--	mg/kg		0.077 U	0.39 U	0.071 U	0.083 U	0.08 U	0.079 U	0.075 UJ	0.072 UJ	0.072 U	0.16 U	0.082 U	0.1 U	0.081 U	0.081 U
Hexachlorocyclopentadiene	--	--	--	mg/kg		0.38 U	1.9 U	0.35 U	0.41 U	0.4 UJ	0.39 UJ	0.37 U	0.35 U	0.36 UJ	0.77 UJ	0.4 UJ	0.5 UJ	0.4 UJ	0.4 U
Hexachloroethane	--	--	--	mg/kg		0.038 U	0.19 U	0.035 U	0.041 U	0.04 U	0.039 U	0.037 U	0.035 U	0.036 U	0.077 U	0.04 U	0.05 U	0.04 U	0.04 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	0.5	8.2	mg/kg		0.038 U	0.19 U	0.022 J	0.041 U	0.079	0.033 J	0.19	0.035 U	0.09	0.077 U	0.04 U	0.05 U	0.04 U	0.09 J
Isophorone	--	--	--	mg/kg		0.15 U	0.76 U	0.14 U	0.16 U	0.16 U	0.16 U	0.15 UJ	0.14 UJ	0.14 U	0.31 U	0.16 U	0.2 U	0.16 U	0.16 U
Naphthalene	12	100	12	mg/kg		0.38 U	1.9 U	0.0067 J	0.41 U	0.023 J	0.39 U	0.035 J	0.35 U	3.2	11	0.91	0.31 J	4.3	0.4 U
Nitrobenzene	--	--	--	mg/kg		0.038 U	0.19 U	0.035 U	0.041 U	0.04 U	0.039 U	0.037 U	0.035 U	0.036 U	0.077 U	0.04 U	0.05 U	0.04 U	0.04 U
N-Nitrosodimethylamine	--	--	--	mg/kg		0.38 U	1.9 U	0.35 U	0.41 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-N-Propylamine	--	--	--	mg/kg		0.038 U	0.19 U	0.035 U	0.041 U	0.04 U	0.039 U	0.037 UJ	0.035 UJ	0.036 U	0.077 U	0.04 U	0.05 U	0.04 U	0.04 U
N-Nitrosodiphenylamine	--	--	--	mg/kg		0.38 U	1.9 U	0.35 U	0.41 U	0.4 U	0.39 U	0.37 U	0.35 U	0.36 U	0.77 U	0.0085 J	0.5 U	0.037 J	0.4 U
Pentachlorophenol	0.8	6.7	0.8	mg/kg		0.31 U	1.5 U	0.28 U	0.33 U	0.32 U	0.31 U	0.3 U	0.29 U	0.29 U	0.62 U	0.33 U	0.41 U	0.32 U	0.32 U
Phenanthrene	100	100	1000	mg/kg		0.38 U	1.9 U	0.027 J	0.41 U	0.039 J	0.02 J	0.14 J	0.018 J	0.068 J	0.067 J	0.016 J	0.031 J	0.055 J	0.071 J
Phenol	0.33	100	0.33	mg/kg		0.38 U	1.9 U	0.35 U	0.41 U	0.4 UT	0.39 UT	0.37 UJ	0.35 UJ	0.36 U	0.77 U	0.4 U	0.5 U	0.4 U	0.4 U
Pyrene	100	100	1000	mg/kg		0.38 U	0.088 J	0.038 J	0.41 U	0.03 J	0.037 J	0.4	0.35 U	0.2 J	0.022 J	0.012 J	0.026 J	0.022 J	0.13 J

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	RX-26 01/12/2021 5 - 7 N	RX-27 01/12/2021 3 - 5 N	RX-27 01/12/2021 7 - 9 N	RX-27 01/12/2021 12 - 14 N	RX-28 01/12/2021 0 - 2 N	RX-28 01/12/2021 5 - 7 N	RX-29 01/12/2021 0 - 2 N	RX-29 01/12/2021 5 - 7 N	RX-29 01/12/2021 5 - 7 FD	RX-3 09/27/2018 0.5 - 2.5 N	RX-3 09/27/2018 0.5 - 2.5 FD	RX-3 09/27/2018 8 - 10 N	RX-5 09/27/2018 0.5 - 2.5 N	RX-5 09/27/2018 5 - 7 N
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
2,4,5-Trichlorophenol	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
2,4,6-Trichlorophenol	--	--	--	mg/kg	0.15 U	0.17 U	0.15 U	0.15 U	0.15 U	0.15 U	0.14 U	0.15 U	0.15 U	0.2 U	0.19 U	0.15 UJ	0.14 U	0.15 U
2,4-Dichlorophenol	--	--	--	mg/kg	0.15 U	0.17 U	0.15 U	0.15 U	0.15 U	0.15 U	0.14 U	0.15 U	0.15 U	0.2 U	0.19 U	0.15 UJ	0.14 U	0.15 U
2,4-Dimethylphenol	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
2,4-Dinitrophenol	--	--	--	mg/kg	0.3 U	0.35 U	0.29 U	0.31 U	0.29 UJ	0.3 U	0.29 U	0.3 U	0.3 U	0.4 U	0.39 U	0.3 UJ	0.29 U	0.3 U
2,4-Dinitrotoluene	--	--	--	mg/kg	0.076 U	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U	0.075 U	0.074 U	0.1 U	0.098 U	0.075 UJ	0.072 U	0.075 U
2,6-Dinitrotoluene	--	--	--	mg/kg	0.076 U	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U	0.075 U	0.074 U	0.1 U	0.098 U	0.075 UJ	0.072 U	0.075 U
2-Chloronaphthalene	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.036 J	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
2-Chlorophenol	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
2-Methylnaphthalene	--	--	--	mg/kg	0.37 U	0.18 J	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.077 J	0.1 J	0.036 J	0.48 U	0.37 UJ	0.35 U	0.37 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
2-Nitroaniline	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
2-Nitrophenol	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg	0.15 U	0.17 U	0.15 U	0.15 U	0.15 U	0.15 U	0.14 U	0.15 U	0.15 U	0.2 U	0.19 U	0.15 U	0.14 U	0.15 U
3-Nitroaniline	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 U	0.35 U	0.37 U
4,6-Dinitro-2-Methylphenol	--	--	--	mg/kg	0.3 U	0.35 U	0.29 U	0.31 U	0.29 UJ	0.3 U	0.29 U	0.3 U	0.3 U	0.4 U	0.39 U	0.3 UJ	0.29 U	0.3 U
4-Bromophenyl Phenyl Ether	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
4-Chloro-3-Methylphenol	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
4-Chloroaniline	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 U	0.35 U	0.37 U
4-Chlorophenyl Phenyl Ether	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
4-Nitroaniline	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
4-Nitrophenol	--	--	--	mg/kg	0.76 U	0.88 U	0.74 U	0.78 U	0.73 U	0.76 U	0.72 U	0.75 U	0.74 U	1 UJ	0.98 UJ	0.75 UJ	0.72 UJ	0.75 U
Acenaphthene	20	100	98	mg/kg	0.012 J	0.014 J	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.17 J	0.31 J	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Acenaphthylene	100	100	107	mg/kg	0.036 J	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.012 J	0.11 J	0.067 J	0.013 J	0.023 J	0.37 UJ	0.35 U	0.37 U
Acetophenone	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.011 J	0.48 U	0.37 UJ	0.35 U	0.37 U
Anthracene	100	100	1000	mg/kg	0.037 J	0.026 J	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.36 J	0.66	0.014 J	0.034 J	0.37 UJ	0.35 U	0.37 U
Atrazine	--	--	--	mg/kg	0.15 U	0.17 U	0.15 U	0.15 U	0.15 U	0.15 U	0.14 U	0.15 UJ	0.15 UJ	0.2 U	0.19 U	0.15 UJ	0.14 U	0.15 U
Benzaldehyde	--	--	--	mg/kg	0.37 UJ	0.43 UJ	0.36 UJ	0.38 UJ	0.36 UJ	0.37 UJ	0.36 UJ	0.37 UJ	0.37 UJ	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Benzidine	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Anthracene	**1**	1	1	mg/kg	0.21	0.074	0.036 U	0.038 U	0.09	0.037 U	0.036 U	0.76	**1.5**	0.072	0.12	0.027 J	0.034 J	0.037 U
Benzo(A)Pyrene	**1**	1	22	mg/kg	0.24 J	0.074 J	0.036 UJ	0.038 UJ	0.12 J	0.022 J	0.026 J	0.78 J	**1.5 J**	0.061	0.1	0.015 J	0.034 J	0.037 U
Benzo(B)Fluoranthene	**1**	1	1.7	mg/kg	0.32	0.11	0.036 U	0.038 U	0.14	0.041	0.033 J	1 J	**2 J**	0.1	0.14	0.024 J	0.049	0.037 U
Benzo(G,H,I)Perylene	100	100	1000	mg/kg	0.087 J	0.054 J	0.36 U	0.38 U	0.085 J	0.37 U	0.049 J	0.37 J	0.75 J	0.052 J	0.098 J	0.011 J	0.044 J	0.37 U
Benzo(K)Fluoranthene	0.8	3.9	1.7	mg/kg	0.12	0.031 J	0.036 U	0.038 U	0.048	0.016 J	0.036 U	0.4	0.67	0.034 J	0.059	0.0092 J	0.018 J	0.037 U
Benzyl Butyl Phthalate	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Biphenyl (Diphenyl)	--	--	--	mg/kg	0.37 U	0.034 J	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.037 J	0.037 J	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Bis(2-Chloroethoxy) Methane	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	mg/kg	0.037 U	0.043 U	0.036 U	0.038 U	0.036 U	0.037 U	0.036 U	0.037 U	0.037 U	0.049 UJ	0.048 UJ	0.037 UJ	0.035 UJ	0.037 U
Bis(2-Chloroisopropyl) Ether	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 U	0.35 U	0.37 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	mg/kg	0.37 U	0.061 J	0.36 U	0.38 U	0.041 J	0.37 U	0.11 J	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.036 J	0.37 U
Caprolactam	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Carbazole	--	--	--	mg/kg	0.014 J	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.2 J	0.38	0.49 U	0.026 J	0.37 UJ	0.35 U	0.37 U
Chrysene	**1**	3.9	1	mg/kg	0.19 J	0.087 J	0.36 U	0.38 U	0.077 J	0.032 J	0.066 J	0.72	**1.3**	0.084 J	0.11 J	0.022 J	0.038 J	0.37 U
Cresols, M & P	0.33	100	0.33	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	RX-26	RX-27	RX-27	RX-27	RX-28	RX-28	RX-29	RX-29	RX-29	RX-3	RX-3	RX-3	RX-5	RX-5
Sample Designation:					RX-26	RX-27	RX-27	RX-27	RX-28	RX-28	RX-29	RX-29	RX-29	RX-3	RX-3	RX-3	RX-5	RX-5
Sample Date:					01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	09/27/2018	09/27/2018	09/27/2018	09/27/2018	09/27/2018
Sample Depth (ft bls):					5 - 7	3 - 5	7 - 9	12 - 14	0 - 2	5 - 7	0 - 2	5 - 7	5 - 7	0.5 - 2.5	0.5 - 2.5	8 - 10	0.5 - 2.5	5 - 7
Normal Sample or Field Duplicate:					N	N	N	N	N	N	N	N	FD	N	FD	N	N	N
Dibenz(A,H)Anthracene	0.33	0.33	1000	mg/kg	0.027 J	0.043 UJ	0.036 UJ	0.038 UJ	0.024 J	0.037 U	0.036 UJ	0.11 J	0.24 J	0.049 U	0.023 J	0.037 UJ	0.035 U	0.037 U
Dibenzofuran	7	59	210	mg/kg	0.37 U	0.059 J	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.13 J	0.24 J	0.49 U	0.012 J	0.37 UJ	0.35 U	0.37 U
Diethyl Phthalate	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Dimethyl Phthalate	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Di-N-Butyl Phthalate	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.12 J	0.48 U	0.37 UJ	0.35 U	0.37 U
Di-N-Octylphthalate	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Fluoranthene	100	100	1000	mg/kg	0.32 J	0.16 J	0.36 U	0.38 U	0.12 J	0.028 J	0.018 J	1.6	3.1	0.11 J	0.21 J	0.031 J	0.035 J	0.37 U
Fluorene	30	100	386	mg/kg	0.37 U	0.023 J	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.17 J	0.31 J	0.49 U	0.019 J	0.37 UJ	0.35 U	0.37 U
Hexachlorobenzene	0.33	1.2	3.2	mg/kg	0.037 U	0.043 U	0.036 U	0.038 U	0.036 UJ	0.037 U	0.036 U	0.037 UJ	0.037 UJ	0.049 U	0.048 U	0.037 UJ	0.035 U	0.037 U
Hexachlorobutadiene	--	--	--	mg/kg	0.076 U	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U	0.075 UJ	0.074 UJ	0.1 U	0.098 U	0.075 UJ	0.072 U	0.075 U
Hexachlorocyclopentadiene	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Hexachloroethane	--	--	--	mg/kg	0.037 U	0.043 U	0.036 U	0.038 U	0.036 U	0.037 U	0.036 U	0.037 U	0.037 U	0.049 UJ	0.048 UJ	0.037 UJ	0.035 UJ	0.037 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	0.5	8.2	mg/kg	0.11 J	0.045 J	0.036 UJ	0.038 UJ	0.068 J	0.022 J	0.036 UJ	0.39	**0.83**	0.054	0.095	0.037 UJ	0.028 J	0.037 U
Isophorone	--	--	--	mg/kg	0.15 U	0.17 U	0.15 U	0.15 U	0.15 U	0.15 U	0.14 U	0.15 U	0.15 U	0.2 U	0.19 U	0.15 UJ	0.14 U	0.15 U
Naphthalene	12	100	12	mg/kg	0.37 U	0.17 J	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.39	0.35 J	0.038 J	0.48 U	0.37 UJ	0.35 U	0.37 U
Nitrobenzene	--	--	--	mg/kg	0.037 U	0.043 U	0.036 U	0.038 U	0.036 U	0.037 U	0.036 U	0.037 U	0.037 U	0.049 UJ	0.048 UJ	0.037 UJ	0.035 UJ	0.037 U
N-Nitrosodimethylamine	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-N-Propylamine	--	--	--	mg/kg	0.037 U	0.043 U	0.036 U	0.038 U	0.036 U	0.037 U	0.036 U	0.037 U	0.037 U	0.049 U	0.048 U	0.037 UJ	0.035 U	0.037 U
N-Nitrosodiphenylamine	--	--	--	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 UJ	0.35 U	0.37 U
Pentachlorophenol	0.8	6.7	0.8	mg/kg	0.3 U	0.35 U	0.29 U	0.31 U	0.29 U	0.3 U	0.29 U	0.3 UJ	0.3 UJ	0.4 U	0.39 U	0.3 UJ	0.29 U	0.3 U
Phenanthrene	100	100	1000	mg/kg	0.14 J	0.11 J	0.36 U	0.38 U	0.04 J	0.02 J	0.019 J	1.5	2.8	0.067 J	0.17 J	0.02 J	0.015 J	0.37 U
Phenol	0.33	100	0.33	mg/kg	0.37 U	0.43 U	0.36 U	0.38 U	0.36 U	0.37 U	0.36 U	0.37 U	0.37 U	0.49 U	0.48 U	0.37 U	0.35 U	0.37 U
Pyrene	100	100	1000	mg/kg	0.32 J	0.16 J	0.36 U	0.38 U	0.12 J	0.031 J	0.026 J	1.4	2.6	0.11 J	0.2 J	0.033 J	0.048 J	0.37 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation: RX-8	RX-8	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-02	SB-21-02	SB-21-02	SB-21-02	SB-21-03	SB-21-03
					Sample Date: 09/27/2018	09/27/2018	11/10/2021	11/10/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/10/2021	11/11/2021
					Sample Depth (ft bls): 0.5 - 2.5	8 - 10	2 - 4	4 - 6	6 - 8	10 - 12	13 - 15	15 - 17	4 - 6	6 - 8	8 - 10	8 - 10	0 - 2	3 - 5
					Normal Sample or Field Duplicate: N	N	N	N	N	N	N	N	N	N	N	FD	N	N
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	NA	NA	0.036 UT	0.036 UT	0.039 U	0.076 U	0.04 U	0.038 U	0.036 U	0.034 U	0.036 U	0.035 U	0.037 UT	0.038 U
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
2,4,5-Trichlorophenol	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
2,4,6-Trichlorophenol	--	--	--	mg/kg	0.14 U	0.16 U	0.15 U	0.15 U	0.16 U	0.31 U	0.16 U	0.15 U	0.15 U	0.14 U	0.14 U	0.14 U	0.15 U	0.15 U
2,4-Dichlorophenol	--	--	--	mg/kg	0.14 U	0.16 U	0.15 U	0.15 U	0.16 U	0.31 U	0.16 U	0.15 U	0.15 U	0.14 U	0.14 U	0.14 U	0.15 U	0.15 U
2,4-Dimethylphenol	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
2,4-Dinitrophenol	--	--	--	mg/kg	0.29 U	0.32 U	0.29 U	0.29 U	0.31 U	0.62 U	0.32 U	0.31 U	0.29 U	0.28 U	0.29 U	0.28 U	0.3 UJ	0.31 U
2,4-Dinitrotoluene	--	--	--	mg/kg	0.072 U	0.08 U	0.073 U	0.074 U	0.079 U	0.16 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U
2,6-Dinitrotoluene	--	--	--	mg/kg	0.072 U	0.08 U	0.073 U	0.074 U	0.079 U	0.16 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U
2-Chloronaphthalene	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
2-Chlorophenol	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
2-Methylnaphthalene	--	--	--	mg/kg	0.0088 J	0.4 U	0.027 J	0.55	5.7	9	0.018 J	0.033 J	0.011 J	0.34 U	0.36 U	0.35 U	0.013 J	0.013 J
2-Methylphenol (O-Cresol)	0.33	100	0.33	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
2-Nitroaniline	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 UJ	0.76 U	0.4 U	0.38 U	0.36 U	0.34 UJ	0.36 UJ	0.35 UJ	0.37 U	0.38 UJ
2-Nitrophenol	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg	0.14 U	0.16 U	0.15 UT	0.15 UT	0.16 U	0.31 U	0.16 U	0.15 U	0.15 U	0.14 U	0.14 U	0.14 U	0.15 UT	0.15 U
3-Nitroaniline	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
4,6-Dinitro-2-Methylphenol	--	--	--	mg/kg	0.29 U	0.32 U	0.29 U	0.29 U	0.31 U	0.62 U	0.32 U	0.31 U	0.29 U	0.28 U	0.29 U	0.28 U	0.3 UJ	0.31 U
4-Bromophenyl Phenyl Ether	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
4-Chloro-3-Methylphenol	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
4-Chloroaniline	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
4-Chlorophenyl Phenyl Ether	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
4-Nitroaniline	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
4-Nitrophenol	--	--	--	mg/kg	0.72 UJ	0.8 UJ	0.73 U	0.74 U	0.79 U	1.6 U	0.8 U	0.77 U	0.74 U	0.7 U	0.73 U	0.71 U	0.75 U	0.77 U
Acenaphthene	20	100	98	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.019 J	0.03 J	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Acenaphthylene	100	100	107	mg/kg	0.35 U	0.4 U	0.008 J	0.0059 J	0.016 J	0.76 U	0.4 U	0.38 U	0.0043 J	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Acetophenone	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Anthracene	100	100	1000	mg/kg	0.0084 J	0.4 U	0.36 U	0.015 J	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.013 J	0.38 U
Atrazine	--	--	--	mg/kg	0.14 U	0.16 U	0.15 U	0.15 U	0.16 U	0.31 U	0.16 U	0.15 U	0.15 U	0.14 U	0.14 U	0.14 U	0.15 U	0.15 U
Benzaldehyde	--	--	--	mg/kg	0.016 J	0.4 U	0.36 UJ	0.36 UJ	0.39 UJ	0.76 UJ	0.4 UJ	0.38 UJ	0.36 UJ	0.34 UJ	0.36 UJ	0.35 UJ	0.37 UJ	0.38 UJ
Benzidine	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Anthracene	**1**	1	1	mg/kg	0.052	0.04 U	0.071	0.055	0.039 U	0.076 U	0.04 U	0.038 U	0.026 J	0.034 U	0.036 U	0.035 U	0.059	0.03 J
Benzo(A)Pyrene	**1**	1	22	mg/kg	0.044	0.04 U	0.073 J	0.045 J	0.039 UJ	0.076 UJ	0.04 U	0.012 J	0.028 J	0.034 U	0.036 UJ	0.035 UJ	0.047	0.023 J
Benzo(B)Fluoranthene	**1**	1	1.7	mg/kg	0.065	0.04 U	0.11 J	0.061 J	0.039 U	0.076 U	0.04 U	0.016 J	0.047	0.034 U	0.036 U	0.035 U	0.07	0.03 J
Benzo(G,H,I)Perylene	100	100	1000	mg/kg	0.031 J	0.4 U	0.068 J	0.036 J	0.39 U	0.76 U	0.4 U	0.013 J	0.036 J	0.34 U	0.36 U	0.35 U	0.037 J	0.017 J
Benzo(K)Fluoranthene	0.8	3.9	1.7	mg/kg	0.024 J	0.04 U	0.037 J	0.024 J	0.039 U	0.076 U	0.04 U	0.038 U	0.016 J	0.034 U	0.036 U	0.035 U	0.027 J	0.013 J
Benzyl Butyl Phthalate	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Biphenyl (Diphenyl)	--	--	--	mg/kg	0.35 U	0.4 U	0.005 J	0.0081 J	0.012 J	0.02 J	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Bis(2-Chloroethoxy) Methane	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	mg/kg	0.035 UJ	0.04 UJ	0.036 U	0.036 U	0.039 U	0.076 U	0.04 U	0.038 U	0.036 U	0.034 U	0.036 U	0.035 U	0.037 U	0.038 U
Bis(2-Chloroisopropyl) Ether	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 UJ	0.76 U	0.4 U	0.38 U	0.36 U	0.34 UJ	0.36 UJ	0.35 UJ	0.37 U	0.38 UJ
Bis(2-Ethylhexyl) Phthalate	--	--	--	mg/kg	0.35 U	0.4 U	0.021 J	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.039 J	0.34 U	0.36 U	0.35 U	0.035 J	0.38 U
Caprolactam	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Carbazole	--	--	--	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Chrysene	**1**	3.9	1	mg/kg	0.063 J	0.4 U	0.083 J	0.06 J	0.39 UJ	0.76 UJ	0.4 U	0.011 J	0.046 J	0.34 U	0.36 UJ	0.35 UJ	0.06 J	0.024 J
Cresols, M & P	0.33	100	0.33	mg/kg	0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	RX-8	RX-8	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-02	SB-21-02	SB-21-02	SB-21-02	SB-21-03	SB-21-03
					Sample Date:	09/27/2018	09/27/2018	11/10/2021	11/10/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/10/2021	11/11/2021
					Sample Depth (ft bls):	0.5 - 2.5	8 - 10	2 - 4	4 - 6	6 - 8	10 - 12	13 - 15	15 - 17	4 - 6	6 - 8	8 - 10	8 - 10	0 - 2	3 - 5
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	FD	N	N
Dibenz(A,H)Anthracene	0.33	0.33	1000	mg/kg		0.035 U	0.04 U	0.036 UJ	0.036 UJ	0.039 U	0.076 U	0.04 U	0.038 U	0.036 U	0.034 U	0.036 U	0.035 U	0.037 U	0.038 U
Dibenzofuran	7	59	210	mg/kg		0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Diethyl Phthalate	--	--	--	mg/kg		0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Dimethyl Phthalate	--	--	--	mg/kg		0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Di-N-Butyl Phthalate	--	--	--	mg/kg		0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.02 J	0.34 U	0.36 U	0.35 U	0.37 U	0.023 J
Di-N-Octylphthalate	--	--	--	mg/kg		0.35 U	0.4 U	0.36 UJ	0.36 UJ	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Fluoranthene	100	100	1000	mg/kg		0.088 J	0.4 U	0.073 J	0.087 J	0.017 J	0.76 U	0.4 U	0.38 U	0.037 J	0.34 U	0.36 U	0.35 U	0.089 J	0.035 J
Fluorene	30	100	386	mg/kg		0.35 U	0.4 U	0.36 U	0.011 J	0.046 J	0.069 J	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.0068 J	0.38 U
Hexachlorobenzene	0.33	1.2	3.2	mg/kg		0.035 U	0.04 U	0.036 U	0.036 U	0.039 U	0.076 U	0.04 U	0.038 U	0.036 U	0.034 U	0.036 U	0.035 U	0.037 U	0.038 U
Hexachlorobutadiene	--	--	--	mg/kg		0.072 U	0.08 U	0.073 U	0.074 U	0.079 U	0.16 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U
Hexachlorocyclopentadiene	--	--	--	mg/kg		0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 UJ	0.38 U
Hexachloroethane	--	--	--	mg/kg		0.035 UJ	0.04 UJ	0.036 U	0.036 U	0.039 U	0.076 U	0.04 U	0.038 U	0.036 U	0.034 U	0.036 U	0.035 U	0.037 U	0.038 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	0.5	8.2	mg/kg		0.031 J	0.04 U	0.059 J	0.034 J	0.039 U	0.076 U	0.04 U	0.038 U	0.027 J	0.034 U	0.036 U	0.035 U	0.036 J	0.016 J
Isophorone	--	--	--	mg/kg		0.14 U	0.16 U	0.15 U	0.15 U	0.16 U	0.31 U	0.16 U	0.15 U	0.15 U	0.14 U	0.14 U	0.14 U	0.15 U	0.15 U
Naphthalene	12	100	12	mg/kg		0.01 J	0.4 U	0.03 J	0.83	1.3	3.7	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.015 J	0.0095 J
Nitrobenzene	--	--	--	mg/kg		0.035 UJ	0.04 UJ	0.036 U	0.036 U	0.039 U	0.076 U	0.04 U	0.038 U	0.036 U	0.034 U	0.036 U	0.035 U	0.037 U	0.038 U
N-Nitrosodimethylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-N-Propylamine	--	--	--	mg/kg		0.035 U	0.04 U	0.036 U	0.036 U	0.039 U	0.076 U	0.04 U	0.038 U	0.036 U	0.034 U	0.036 U	0.035 U	0.037 U	0.038 U
N-Nitrosodiphenylamine	--	--	--	mg/kg		0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Pentachlorophenol	0.8	6.7	0.8	mg/kg		0.29 U	0.32 U	0.29 U	0.29 U	0.31 U	0.62 U	0.32 UJ	0.31 UJ	0.29 U	0.28 U	0.29 U	0.28 U	0.3 UJ	0.31 U
Phenanthrene	100	100	1000	mg/kg		0.058 J	0.4 U	0.038 J	0.059 J	0.056 J	0.088 J	0.4 U	0.007 J	0.025 J	0.34 U	0.36 U	0.35 U	0.053 J	0.026 J
Phenol	0.33	100	0.33	mg/kg		0.35 U	0.4 U	0.36 U	0.36 U	0.39 U	0.76 U	0.4 U	0.38 U	0.36 U	0.34 U	0.36 U	0.35 U	0.37 U	0.38 U
Pyrene	100	100	1000	mg/kg		0.09 J	0.4 U	0.074 J	0.085 J	0.021 J	0.019 J	0.4 U	0.012 J	0.042 J	0.34 U	0.36 U	0.35 U	0.079 J	0.03 J

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	SB-21-03 11/11/2021 5 - 7 N	SB-21-03 11/11/2021 7 - 9 N	SB-21-04 11/09/2021 0 - 2 N	SB-21-04 11/09/2021 0 - 2 FD	SB-21-04 11/12/2021 4 - 6 N	SB-21-04 11/12/2021 6 - 8 N	SB-21-04 11/12/2021 8 - 10 N	SB-21-05 11/12/2021 4 - 6 N	SB-21-05 11/12/2021 6 - 8 N	SB-21-05 11/12/2021 8 - 10 N	SB-21-06 11/10/2021 0 - 2 N	SB-21-06 11/10/2021 2 - 4 N	SB-21-06 11/10/2021 2 - 4 FD	SB-21-06 11/10/2021 4 - 6 N
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	0.036 U	0.037 U	0.19 U	0.18 U	0.038 U	0.036 U	0.035 U	0.037 UT	0.035 UT	0.035 UT	0.037 UT	0.035 UT	0.036 UT	0.04 UT
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
2,4,5-Trichlorophenol	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
2,4,6-Trichlorophenol	--	--	--	mg/kg	0.15 U	0.15 U	0.76 U	0.73 U	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.15 U	0.16 U
2,4-Dichlorophenol	--	--	--	mg/kg	0.15 U	0.15 U	0.76 U	0.73 U	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.15 U	0.16 U
2,4-Dimethylphenol	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.054 J	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
2,4-Dinitrophenol	--	--	--	mg/kg	0.29 U	0.3 U	1.5 U	1.5 U	0.31 U	0.29 U	0.29 U	0.29 U	0.28 U	0.28 U	0.29 U	0.28 U	0.29 U	0.32 U
2,4-Dinitrotoluene	--	--	--	mg/kg	0.073 U	0.074 U	0.38 U	0.37 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U
2,6-Dinitrotoluene	--	--	--	mg/kg	0.073 U	0.074 U	0.38 U	0.37 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U
2-Chloronaphthalene	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
2-Chlorophenol	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
2-Methylnaphthalene	--	--	--	mg/kg	0.36 U	0.012 J	1.9 U	1.8 U	0.011 J	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.011 J	0.35 U	0.017 J	0.4 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
2-Nitroaniline	--	--	--	mg/kg	0.36 UJ	0.37 UJ	1.9 U	1.8 U	0.38 UT	0.36 UT	0.35 UT	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
2-Nitrophenol	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg	0.15 U	0.15 U	0.76 UT	0.73 UT	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.14 U	0.15 UT	0.14 UT	0.15 UT	0.16 UT
3-Nitroaniline	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
4,6-Dinitro-2-Methylphenol	--	--	--	mg/kg	0.29 U	0.3 U	1.5 U	1.5 U	0.31 U	0.29 U	0.29 U	0.29 U	0.28 U	0.28 U	0.29 U	0.28 U	0.29 U	0.32 U
4-Bromophenyl Phenyl Ether	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
4-Chloro-3-Methylphenol	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
4-Chloroaniline	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
4-Chlorophenyl Phenyl Ether	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
4-Nitroaniline	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
4-Nitrophenol	--	--	--	mg/kg	0.73 U	0.74 U	3.8 U	3.7 U	0.77 UJ	0.72 UJ	0.72 UJ	0.74 U	0.71 U	0.7 U	0.74 U	0.71 U	0.74 U	0.81 U
Acenaphthene	20	100	98	mg/kg	0.36 U	0.37 U	0.067 J	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Acenaphthylene	100	100	107	mg/kg	0.015 J	0.37 U	0.085 J	0.058 J	0.015 J	0.36 U	0.35 U	0.0062 J	0.35 U	0.35 U	0.029 J	0.031 J	0.055 J	0.014 J
Acetophenone	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Anthracene	100	100	1000	mg/kg	0.014 J	0.043 J	0.22 J	0.071 J	0.021 J	0.36 U	0.35 U	0.012 J	0.35 U	0.35 U	0.012 J	0.016 J	0.032 J	0.023 J
Atrazine	--	--	--	mg/kg	0.15 U	0.15 U	0.76 U	0.73 U	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.15 U	0.16 U
Benzaldehyde	--	--	--	mg/kg	0.36 UJ	0.37 UJ	1.9 UJ	1.8 UJ	0.38 UJ	0.36 UJ	0.35 UJ	0.37 UJ	0.35 UJ	0.35 UJ	0.37 UJ	0.35 UJ	0.36 UJ	0.4 UJ
Benzidine	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Anthracene	**1**	1	1	mg/kg	0.073	0.037 U	0.51	0.32	0.11	0.036 U	0.035 U	0.087	0.041	0.035 U	0.12	0.17	0.23	0.11
Benzo(A)Pyrene	**1**	1	22	mg/kg	0.078 J	0.037 UJ	0.54	0.33	0.16 T	0.036 UT	0.035 UT	0.072	0.025 J	0.035 U	0.15	0.2	0.28 J	0.12
Benzo(B)Fluoranthene	**1**	1	1.7	mg/kg	0.1	0.037 U	0.64	0.43	0.19	0.036 U	0.035 U	0.1	0.032 J	0.035 U	0.22	0.26	0.41 J	0.16
Benzo(G,H,I)Perylene	100	100	1000	mg/kg	0.059 J	0.37 U	0.36 J	0.22 J	0.12 J	0.36 U	0.35 U	0.052 J	0.015 J	0.35 U	0.095 J	0.12 J	0.17 J	0.085 J
Benzo(K)Fluoranthene	0.8	3.9	1.7	mg/kg	0.048	0.037 U	0.26	0.18	0.069	0.036 U	0.035 U	0.034 J	0.017 J	0.035 U	0.075	0.093	0.17 J	0.078
Benzyl Butyl Phthalate	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Biphenyl (Diphenyl)	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Bis(2-Chloroethoxy) Methane	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	mg/kg	0.036 U	0.037 U	0.19 U	0.18 U	0.038 U	0.036 U	0.035 U	0.037 U	0.035 U	0.035 U	0.037 U	0.035 U	0.036 U	0.04 U
Bis(2-Chloroisopropyl) Ether	--	--	--	mg/kg	0.36 UJ	0.37 UJ	1.9 UJ	1.8 UJ	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.026 J	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.05 J	0.047 J	0.067 J	0.4 U
Caprolactam	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Carbazole	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Chrysene	**1**	3.9	1	mg/kg	0.075 J	0.37 UJ	0.47 J	0.29 J	0.14 J	0.36 U	0.35 U	0.086 J	0.033 J	0.35 U	0.14 J	0.17 J	0.28 J	0.12 J
Cresols, M & P	0.33	100	0.33	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	SB-21-03 11/11/2021 5 - 7 N	SB-21-03 11/11/2021 7 - 9 N	SB-21-04 11/09/2021 0 - 2 N	SB-21-04 11/09/2021 0 - 2 FD	SB-21-04 11/12/2021 4 - 6 N	SB-21-04 11/12/2021 6 - 8 N	SB-21-04 11/12/2021 8 - 10 N	SB-21-05 11/12/2021 4 - 6 N	SB-21-05 11/12/2021 6 - 8 N	SB-21-05 11/12/2021 8 - 10 N	SB-21-06 11/10/2021 0 - 2 N	SB-21-06 11/10/2021 2 - 4 N	SB-21-06 11/10/2021 2 - 4 FD	SB-21-06 11/10/2021 4 - 6 N
Dibenz(A,H)Anthracene	0.33	0.33	1000	mg/kg	0.018 J	0.037 U	0.19 U	0.18 U	0.027 J	0.036 U	0.035 U	0.037 U	0.035 U	0.035 U	0.031 J	0.043	0.065 J	0.026 J
Dibenzofuran	7	59	210	mg/kg	0.36 U	0.017 J	0.057 J	1.8 U	0.0072 J	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.0055 J	0.0064 J
Diethyl Phthalate	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Dimethyl Phthalate	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Di-N-Butyl Phthalate	--	--	--	mg/kg	0.015 J	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.016 J	0.017 J	0.36 U	0.4 U
Di-N-Octylphthalate	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 UJ	0.4 U
Fluoranthene	100	100	1000	mg/kg	0.092 J	0.37 U	1.2 J	0.6 J	0.19 J	0.36 U	0.35 U	0.11 J	0.13 J	0.35 U	0.15 J	0.19 J	0.29 J	0.17 J
Fluorene	30	100	386	mg/kg	0.36 U	0.37 U	0.095 J	1.8 U	0.0092 J	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.0049 J	0.012 J	0.0086 J
Hexachlorobenzene	0.33	1.2	3.2	mg/kg	0.036 U	0.037 U	0.19 U	0.18 U	0.038 U	0.036 U	0.035 U	0.037 U	0.035 U	0.035 U	0.037 U	0.035 U	0.036 U	0.04 U
Hexachlorobutadiene	--	--	--	mg/kg	0.073 U	0.074 U	0.38 U	0.37 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U
Hexachlorocyclopentadiene	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Hexachloroethane	--	--	--	mg/kg	0.036 U	0.037 U	0.19 U	0.18 U	0.038 U	0.036 U	0.035 U	0.037 U	0.035 U	0.035 U	0.037 U	0.035 U	0.036 U	0.04 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	0.5	8.2	mg/kg	0.061	0.037 U	0.35	0.24	0.11	0.036 U	0.035 U	0.054	0.016 J	0.035 U	0.1	0.14	0.2 J	0.091
Isophorone	--	--	--	mg/kg	0.15 U	0.15 U	0.76 U	0.73 U	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.14 U	0.15 U	0.14 U	0.15 U	0.16 U
Naphthalene	12	100	12	mg/kg	0.36 U	0.03 J	0.066 J	1.8 U	0.019 J	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.0096 J	0.011 J	0.016 J	0.022 J
Nitrobenzene	--	--	--	mg/kg	0.036 U	0.037 U	0.19 U	0.18 U	0.038 U	0.036 U	0.035 U	0.037 U	0.035 U	0.035 U	0.037 U	0.035 U	0.036 U	0.04 U
N-Nitrosodimethylamine	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-N-Propylamine	--	--	--	mg/kg	0.036 U	0.037 U	0.19 U	0.18 U	0.038 UT	0.036 UT	0.035 UT	0.037 U	0.035 U	0.035 U	0.037 U	0.035 U	0.036 U	0.04 U
N-Nitrosodiphenylamine	--	--	--	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Pentachlorophenol	0.8	6.7	0.8	mg/kg	0.29 U	0.3 U	1.5 U	1.5 U	0.31 U	0.29 U	0.29 U	0.29 U	0.28 U	0.28 U	0.29 U	0.28 U	0.29 U	0.32 U
Phenanthrene	100	100	1000	mg/kg	0.042 J	0.018 J	0.89 J	0.29 J	0.11 J	0.36 U	0.35 U	0.046 J	0.086 J	0.35 U	0.045 J	0.058 J	0.087 J	0.1 J
Phenol	0.33	100	0.33	mg/kg	0.36 U	0.37 U	1.9 U	1.8 U	0.38 U	0.36 U	0.35 U	0.37 U	0.35 U	0.35 U	0.37 U	0.35 U	0.36 U	0.4 U
Pyrene	100	100	1000	mg/kg	0.089 J	0.37 U	1.1 J	0.57 J	0.21 J	0.36 U	0.35 U	0.099 J	0.11 J	0.35 U	0.16 J	0.19 J	0.33 J	0.17 J

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	SB-21-06 11/12/2021 6 - 8 N	SB-21-07 11/09/2021 0 - 2 N	SB-21-07 11/09/2021 2 - 4 N	SB-21-07 11/12/2021 4 - 6 N	SB-21-07 11/12/2021 6 - 8 N	SB-21-08 11/10/2021 0 - 2 N	SB-21-08 11/12/2021 3 - 5 N	SB-21-08 11/12/2021 5 - 7 N	SB-21-08 11/12/2021 7 - 9 N	SB-21-09 11/09/2021 0 - 2 N	SB-21-09 11/12/2021 4 - 6 N	SB-21-09 11/12/2021 6 - 8 N	SB-21-09 11/12/2021 8 - 10 N
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	mg/kg	0.034 U	0.036 U	0.18 U	0.035 UT	0.036 U	0.035 UT	0.036 U	0.036 U	0.035 U	0.037 U	0.038 U	0.036 U	0.036 U
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
2,4,5-Trichlorophenol	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
2,4,6-Trichlorophenol	--	--	--	mg/kg	0.14 U	0.14 U	0.73 U	0.14 U	0.14 U	0.14 U	0.14 U	0.15 U	0.14 U	0.15 U	0.15 U	0.15 U	0.14 U
2,4-Dichlorophenol	--	--	--	mg/kg	0.14 U	0.14 U	0.73 U	0.14 U	0.14 U	0.14 U	0.14 U	0.15 U	0.14 U	0.15 U	0.15 U	0.15 U	0.14 U
2,4-Dimethylphenol	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
2,4-Dinitrophenol	--	--	--	mg/kg	0.27 U	0.29 U	1.5 U	0.28 U	0.29 U	0.28 UJ	0.29 U	0.29 U	0.28 U	0.3 U	0.31 U	0.29 U	0.29 U
2,4-Dinitrotoluene	--	--	--	mg/kg	0.069 U	0.072 U	0.37 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
2,6-Dinitrotoluene	--	--	--	mg/kg	0.069 U	0.072 U	0.37 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
2-Chloronaphthalene	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.018 J	0.38 U	0.36 U	0.36 U
2-Chlorophenol	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
2-Methylnaphthalene	--	--	--	mg/kg	0.34 U	0.011 J	1.8 U	0.35 U	0.36 U	0.024 J	0.02 J	0.36 U	0.35 U	0.022 J	0.38 U	0.36 U	0.36 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 UJ	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
2-Nitroaniline	--	--	--	mg/kg	0.34 UT	0.36 U	1.8 U	0.35 U	0.36 UJ	0.35 U	0.36 UT	0.36 UT	0.35 UT	0.37 U	0.38 UT	0.36 UT	0.36 UT
2-Nitrophenol	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg	0.14 U	0.14 UT	0.73 UT	0.14 U	0.14 U	0.14 UT	0.14 U	0.15 U	0.14 U	0.15 UT	0.15 U	0.15 U	0.14 U
3-Nitroaniline	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
4,6-Dinitro-2-Methylphenol	--	--	--	mg/kg	0.27 U	0.29 UJ	1.5 U	0.28 U	0.29 U	0.28 UJ	0.29 U	0.29 U	0.28 U	0.3 U	0.31 U	0.29 U	0.29 U
4-Bromophenyl Phenyl Ether	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
4-Chloro-3-Methylphenol	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 UJ	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
4-Chloroaniline	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
4-Chlorophenyl Phenyl Ether	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
4-Nitroaniline	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
4-Nitrophenol	--	--	--	mg/kg	0.69 UJ	0.72 U	3.7 U	0.71 U	0.73 UJ	0.72 U	0.73 UJ	0.74 UJ	0.71 UJ	0.76 U	0.78 UJ	0.74 UJ	0.72 UJ
Acenaphthene	20	100	98	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.074 J	0.064 J	0.36 U	0.35 U	0.013 J	0.38 U	0.36 U	0.36 U
Acenaphthylene	100	100	107	mg/kg	0.34 U	0.023 J	1.8 U	0.35 U	0.36 U	0.0072 J	0.0063 J	0.36 U	0.35 U	0.028 J	0.38 U	0.36 U	0.36 U
Acetophenone	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 UJ	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Anthracene	100	100	1000	mg/kg	0.34 U	0.022 J	1.8 U	0.35 U	0.36 UJ	0.11 J	0.11 J	0.36 U	0.35 U	0.045 J	0.38 U	0.36 U	0.36 U
Atrazine	--	--	--	mg/kg	0.14 U	0.14 U	0.73 U	0.086 J	0.14 U	0.14 U	0.14 U	0.15 U	0.14 U	0.15 U	0.15 U	0.15 U	0.14 U
Benzaldehyde	--	--	--	mg/kg	0.34 UJ	0.36 UJ	1.8 UJ	0.35 UJ	0.36 UJ	0.35 UJ	0.36 UJ	0.36 UJ	0.35 UJ	0.37 UJ	0.38 UJ	0.36 UJ	0.36 UJ
Benzidine	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Anthracene	**1**	1	1	mg/kg	0.034 U	0.1	0.18 U	0.035 U	0.036 UJ	0.22	0.21	0.018 J	0.035 U	0.14	0.055	0.036 U	0.036 U
Benzo(A)Pyrene	**1**	1	22	mg/kg	0.034 UT	0.12	0.062 J	0.015 J	0.036 UJ	0.19	0.16 T	0.013 JT	0.035 UT	0.13	0.053 T	0.036 UT	0.036 UT
Benzo(B)Fluoranthene	**1**	1	1.7	mg/kg	0.034 U	0.17	0.082 J	0.027 J	0.036 UJ	0.29	0.22	0.018 J	0.035 U	0.22	0.068	0.036 U	0.036 U
Benzo(G,H,I)Perylene	100	100	1000	mg/kg	0.34 U	0.098 J	0.061 J	0.017 J	0.36 U	0.11 J	0.078 J	0.36 U	0.35 U	0.088 J	0.038 J	0.36 U	0.36 U
Benzo(K)Fluoranthene	0.8	3.9	1.7	mg/kg	0.034 U	0.056	0.044 J	0.035 U	0.036 UJ	0.11	0.086	0.0081 J	0.035 U	0.07	0.025 J	0.036 U	0.036 U
Benzyl Butyl Phthalate	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.062 J	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Biphenyl (Diphenyl)	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.0067 J	0.36 U	0.36 U	0.35 U	0.0056 J	0.38 U	0.36 U	0.36 U
Bis(2-Chloroethoxy) Methane	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 UJ	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	mg/kg	0.034 U	0.036 U	0.18 U	0.035 U	0.036 UJ	0.035 U	0.036 U	0.036 U	0.035 U	0.037 U	0.038 U	0.036 U	0.036 U
Bis(2-Chloroisopropyl) Ether	--	--	--	mg/kg	0.34 U	0.36 UJ	1.8 UJ	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 UJ	0.38 U	0.36 U	0.36 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	mg/kg	0.34 U	0.036 J	1.8 U	0.35 U	0.36 U	0.098 J	0.17 J	0.037 J	0.35 U	0.09 J	0.031 J	0.36 U	0.36 U
Caprolactam	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.057 J	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Carbazole	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 UJ	0.045 J	0.043 J	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Chrysene	**1**	3.9	1	mg/kg	0.34 U	0.11 J	0.063 J	0.059 J	0.36 UJ	0.21 J	0.22 J	0.016 J	0.35 U	0.15 J	0.05 J	0.36 U	0.36 U
Cresols, M & P	0.33	100	0.33	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	SB-21-06 11/12/2021 6 - 8 N	SB-21-07 11/09/2021 0 - 2 N	SB-21-07 11/09/2021 2 - 4 N	SB-21-07 11/12/2021 4 - 6 N	SB-21-07 11/12/2021 6 - 8 N	SB-21-08 11/10/2021 0 - 2 N	SB-21-08 11/12/2021 3 - 5 N	SB-21-08 11/12/2021 5 - 7 N	SB-21-08 11/12/2021 7 - 9 N	SB-21-09 11/09/2021 0 - 2 N	SB-21-09 11/12/2021 4 - 6 N	SB-21-09 11/12/2021 6 - 8 N	SB-21-09 11/12/2021 8 - 10 N
Dibenz(A,H)Anthracene	0.33	0.33	1000	mg/kg	0.034 U	0.02 J	0.18 U	0.035 U	0.036 UJ	0.036	0.025 J	0.036 U	0.035 U	0.025 J	0.038 U	0.036 U	0.036 U
Dibenzofuran	7	59	210	mg/kg	0.34 U	0.0053 J	1.8 U	0.35 U	0.36 U	0.035 J	0.037 J	0.36 U	0.35 U	0.011 J	0.38 U	0.36 U	0.36 U
Diethyl Phthalate	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Dimethyl Phthalate	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 U	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Di-N-Butyl Phthalate	--	--	--	mg/kg	0.34 U	0.047 J	1.8 U	0.35 U	0.36 UJ	0.015 J	0.36 U	0.36 U	0.35 U	0.11 J	0.38 U	0.36 U	0.36 U
Di-N-Octylphthalate	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 UJ	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Fluoranthene	100	100	1000	mg/kg	0.34 U	0.15 J	0.083 J	0.022 J	0.36 U	0.47	0.45	0.026 J	0.35 U	0.31 J	0.083 J	0.36 U	0.36 U
Fluorene	30	100	386	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 UJ	0.055 J	0.053 J	0.36 U	0.35 U	0.018 J	0.38 U	0.36 U	0.36 U
Hexachlorobenzene	0.33	1.2	3.2	mg/kg	0.034 U	0.036 U	0.18 U	0.035 U	0.036 U	0.035 U	0.036 U	0.036 U	0.035 U	0.037 U	0.038 U	0.036 U	0.036 U
Hexachlorobutadiene	--	--	--	mg/kg	0.069 U	0.072 U	0.37 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
Hexachlorocyclopentadiene	--	--	--	mg/kg	0.34 U	0.36 UJ	1.8 U	0.35 U	0.36 U	0.35 UJ	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Hexachloroethane	--	--	--	mg/kg	0.034 U	0.036 U	0.18 U	0.035 U	0.036 U	0.035 U	0.036 U	0.036 U	0.035 U	0.037 U	0.038 U	0.036 U	0.036 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	0.5	8.2	mg/kg	0.034 U	0.088	0.18 U	0.015 J	0.036 U	0.12	0.092	0.014 J	0.035 U	0.099	0.038	0.036 U	0.036 U
Isophorone	--	--	--	mg/kg	0.14 U	0.14 U	0.73 U	0.14 U	0.14 UJ	0.14 U	0.14 U	0.15 U	0.14 U	0.15 U	0.15 U	0.15 U	0.14 U
Naphthalene	12	100	12	mg/kg	0.34 U	0.011 J	1.8 U	0.35 U	0.36 U	0.077 J	0.03 J	0.36 U	0.35 U	0.035 J	0.38 U	0.36 U	0.36 U
Nitrobenzene	--	--	--	mg/kg	0.034 U	0.036 U	0.18 U	0.035 U	0.036 UJ	0.035 U	0.036 U	0.036 U	0.035 U	0.037 U	0.038 U	0.036 U	0.036 U
N-Nitrosodimethylamine	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-N-Propylamine	--	--	--	mg/kg	0.034 UT	0.036 U	0.18 U	0.035 U	0.036 UJ	0.035 U	0.036 UT	0.036 UT	0.035 UT	0.037 U	0.038 UT	0.036 UT	0.036 UT
N-Nitrosodiphenylamine	--	--	--	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 UJ	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Pentachlorophenol	0.8	6.7	0.8	mg/kg	0.27 U	0.29 U	1.5 U	0.28 U	0.29 U	0.28 U	0.29 U	0.29 U	0.28 U	0.3 U	0.31 U	0.29 U	0.29 U
Phenanthrene	100	100	1000	mg/kg	0.34 U	0.064 J	1.8 U	0.024 J	0.36 UJ	0.39	0.47	0.022 J	0.35 U	0.18 J	0.049 J	0.36 U	0.36 U
Phenol	0.33	100	0.33	mg/kg	0.34 U	0.36 U	1.8 U	0.35 U	0.36 UJ	0.35 U	0.36 U	0.36 U	0.35 U	0.37 U	0.38 U	0.36 U	0.36 U
Pyrene	100	100	1000	mg/kg	0.34 U	0.14 J	0.073 J	0.027 J	0.36 U	0.39	0.37	0.024 J	0.35 U	0.26 J	0.089 J	0.36 U	0.36 U

Table 4. Summary of Metals in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	F1	F1	F2	F2	F2	F3	F3	F3	G1	G1	G1	G2	G2	G2
					Sample Date:	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/11/2021	11/11/2021	11/10/2021	11/12/2021	11/12/2021
					Sample Depth (ft bls):	0 - 4.5	4.5 - 10.5	10.5 - 16.5	0 - 4	4 - 10	10 - 16	0 - 3.25	3.5 - 9.5	9.5 - 15.5	0 - 3	3 - 9	9 - 15	0 - 3	3 - 9	9 - 15
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Aluminum	--	--	--	mg/kg		2340	4400	4990	8220	10700	5520	5700	9690	5150	5640	7670	8120	6690	9200	2880
Antimony	--	--	--	mg/kg		0.43 J	0.74 J	1 U	0.19 J	0.98 U	1.2 U	0.29 J	1 U	1.2 U	0.27 J	0.17 J	1.1 U	0.8 J	1 U	1.1 U
Arsenic	**13**	16	16	mg/kg		3.4	1.4	1.5	3.8	0.72 J	1.6	4.6	0.54 J	1.4	11.7	2.5	1.8	7.7	2.8	1.5
Barium	**350**	400	820	mg/kg		41.9	23.7	21.9	85	23.5	24.3	119	26.2	27	58.6	65.2	30.9	134	40.9	20.9
Beryllium	7.2	72	47	mg/kg		0.091 J	0.18 J	0.26 J	0.32 J	0.31 J	0.26 J	0.31 J	0.42	0.32 J	0.54	0.48	0.38 J	0.42 J	0.4 J	0.17 J
Cadmium	**2.5**	4.3	7.5	mg/kg		0.45 J	2	1 U	0.82 J	0.14 J	1.2 U	**7.9**	0.15 J	1.2 U	0.64 J	0.48 J	1.1 U	**3.3**	0.18 J	1.1 U
Calcium	--	--	--	mg/kg		7300	154000	3450	26000	126000	80500	16600	139000	2130	59400	49300	4320	45800	117000	170000
Chromium III	30	180	--	mg/kg		12.4	7.5	8.1	15.5	13.2	8.7	11.2	10.7	10.2	12.4	12.6	12.4	15.7	11.2	4.9
Chromium, Hexavalent	1	110	19	mg/kg		2.1 U	2.1 U	2.1 U	2.2 U	2.1 U	2.5 U	2.3 U	2.2 U	2.5 U	2.2 U	2.2 U	2.4 U	2.2 U	2.2 U	2.3 U
Chromium, Total	30	180	--	mg/kg		12.4	7.5	8.1	15.5	13.2	8.7	11.2	10.7	10.2	12.4	12.3	12.4	15.7	11.2	4.9
Cobalt	--	--	--	mg/kg		1.7 J	1.3 J	3.5	6.6	4	2.9	5.2	2.5	4.6	4.5	4	5.1	5	4.3	2.1 J
Copper	**50**	270	1720	mg/kg		**117**	28.6	7	41.1	7.6	5.4	**91**	6.5	8	36.8	32	9.8	**90.3**	13.1	3.3
Cyanide	27	27	40	mg/kg		0.23 U	0.24 U	0.26 U	0.25 U	0.24 U	0.3 U	5.7	0.27 U	0.27 U	0.24 U	0.25 U	0.25 U	0.26 U	0.26 U	0.27 U
Iron	--	--	--	mg/kg		10300	5690	8960	13600	7870	8140	10400	7040	12100	13600	11100	11600	16500	10700	5020
Lead	**63**	400	450	mg/kg		**261**	**65.8**	5.9	**104**	4.1	4	**290**	4.3	4.5	**91.2**	50.4	8.5	**234**	22.6	5.1
Magnesium	--	--	--	mg/kg		2860	66600	3300	7900	71000	42900	4750	77700	3150	14600	28600	4930	23000	66100	79600
Manganese	1600	2000	2000	mg/kg		67.6	99.2	234	211	123	215	166	150	563	154	172	128	225	148	146
Mercury	**0.18**	0.81	0.73	mg/kg		0.15	0.14	0.057	**0.24**	0.054	0.022	**0.27**	0.034	0.015 J	**0.31**	0.11	0.019 U	**0.51**	0.073	0.022
Nickel	**30**	310	130	mg/kg		5.7	4.2	8.1	18.8	6.2	6.9	**51.3**	5.7	10.3	13.4	9.4	10.7	22.2	7.8	5
Potassium	--	--	--	mg/kg		270	1880	665	2230	6320	2000	1130	7270	950	790	2170	907	1540	5160	1860
Selenium	3.9	180	4	mg/kg		0.14 J	1.3 U	1.3 U	0.22 J	1.2 U	1.5 U	0.55 J	1.3 U	1.4 U	0.46 J	0.17 J	1.4 U	0.98 J	0.21 J	1.4 U
Silver	2	180	8.3	mg/kg		0.23 J	1 U	1 U	0.29 J	0.98 U	1.2 U	0.47 J	1 U	1.2 U	0.13 J	1.1 U	1.1 U	0.59 J	1 U	1.1 U
Sodium	--	--	--	mg/kg		90.6 J	748	210	566	1740	531	239	918	343	119	233	190	323	840	228
Thallium	--	--	--	mg/kg		0.41 U	0.057 J	0.4 U	0.15 J	0.043 J	0.48 U	0.13 J	0.091 J	0.46 U	0.47	0.14 J	0.084 J	0.22 J	0.11 J	0.17 J
Vanadium	--	--	--	mg/kg		11	6.9	10.1	33.5	14.6	9.5	32.5	15.4	12.1	26.7	15.5	15	33.5	14.7	5.1
Zinc	**109**	10000	2480	mg/kg		**306**	**541**	21.1	**157**	32.6	22.1	**399**	49.4	24.5	**125**	**236**	31.6	**453**	90.6	26.1

Table 4. Summary of Metals in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	G3	G3	MR-11	MR-11	MR-9	MR-9	RX-1	RX-1	RX-2	RX-2	RX-26	RX-26	RX-27	RX-27
					Sample Date:	11/09/2021	11/11/2021	07/23/2018	07/23/2018	07/26/2018	07/26/2018	09/26/2018	09/26/2018	09/26/2018	09/26/2018	01/12/2021	01/12/2021	01/12/2021	01/12/2021
					Sample Depth (ft bls):	0 - 2.5	2.5 - 8.5	8.5 - 14.5	0.25 - 0.75	5 - 6.5	1 - 1.5	8 - 9	0.5 - 2.5	8 - 10	0.5 - 2.5	10 - 12	3 - 5	5 - 7	3 - 5	7 - 9
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Aluminum	--	--	--	mg/kg		5350	6850	7110	5630	9740	6940	4960	4550	15700	8590	6580	6130 J	5350 J	8680 J	9080 J
Antimony	--	--	--	mg/kg		0.61 J	0.29 J	1.2 U	1.1 U	1.1 U	0.86 U	0.84 U	0.38 J	1.1 U	0.86 J	1 U	0.52 J	0.42 J	0.46 J	0.94 UJ
Arsenic	**13**	16	16	mg/kg		4.6	4.6	2.8	6.5	3.4	10.5	1.8	**15**	0.95 J	**46.2**	2.1	**15.9**	7.6	11.2	2.2
Barium	**350**	400	820	mg/kg		102	127	32.8	89.3	306	130	53.5	75	34.1	150	28.8	77.2 J	67.8 J	**532 J**	41.4 J
Beryllium	7.2	72	47	mg/kg		0.27 J	0.29 J	0.39 J	0.23 J	0.4 J	0.36	0.14 J	0.6	0.48	1.4	0.42	0.47	0.29 J	0.47 J	0.34 J
Cadmium	**2.5**	4.3	7.5	mg/kg		1.8	0.44 J	1.2 U	0.41 J	1.1 U	0.84 J	0.84 U	0.93 J	1.1 U	0.77 J	1 U	0.85 J	0.55 J	**3.3**	0.18 J
Calcium	--	--	--	mg/kg		31800	40900	24600	27300	21900	69800	141000	21700	149000	27700	9660	38900 J	8330 J	51300 J	23900 J
Chromium III	30	180	--	mg/kg		10.5	16.2	11.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Hexavalent	1	110	19	mg/kg		2.3 U	2.1 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Total	30	180	--	mg/kg		10.5	16.2	11.7	15.6	15.7	18.4	10.7	12.1	17.4	21.5	11.3	13.3	17.1	17.3	16.8
Cobalt	--	--	--	mg/kg		4.5	5.4	4.9	3.9	5.9	5.6	3.2	4.1	4	6.6	5.1	6	4.2	7.3	5.3
Copper	**50**	270	1720	mg/kg		**57.9**	**61.1**	9.1	24	20.2	**58.6**	15.6	**55.2**	8.6	**78.2**	9.1	**77.2 J**	43.4 J	**68.9 J**	19.4 J
Cyanide	27	27	40	mg/kg		0.24 U	0.25 U	0.28 U	0.29 U	0.32	0.071 J	0.094 J	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	--	--	mg/kg		10500	17700	12100	10700	15000	16600	7230	13400	9250	24200	10800	18900	11900	17700	13000
Lead	**63**	400	450	mg/kg		**458**	**147**	7.9	**70.4**	**95.3**	**134**	34	**127**	13.1	**307**	9.8	**134 J**	**148 J**	**204 J**	26.8 J
Magnesium	--	--	--	mg/kg		16900	21700	14100	11900	16300	22000	64500	10400	87600	6870	8320	20200 J	4170 J	16700 J	19100 J
Manganese	1600	2000	2000	mg/kg		145	268	152	139	206	194	129	121	137	123	137	132	176	229	217
Mercury	**0.18**	0.81	0.73	mg/kg		0.16	0.12	0.013 J	0.053	0.13	**0.2**	0.033	**1.7**	0.026	**0.26**	0.02 U	**6.4**	**1.1**	**0.44**	0.024
Nickel	**30**	310	130	mg/kg		16.4	19.6	11.4	11.2	12.1	19.6	8.4	13	10.1	18.4	11.1	16.5	12	23.9	13
Potassium	--	--	--	mg/kg		803	1310	1520	941	1840	1860	2290	793	5930	1000	1250	1010	506	1250	1090
Selenium	3.9	180	4	mg/kg		0.3 J	0.32 J	1.5 U	0.56 J	5.6 U	0.61 J	4.2 U	1.1 J	5.4 U	3 J	5.1 U	1.2 J	0.59 J	0.93 J	0.18 J
Silver	2	180	8.3	mg/kg		0.37 J	0.11 J	1.2 U	1.1 U	1.1 U	0.86 U	0.84 U	0.97 U	1.1 U	1.3 U	1 U	0.24 J	0.17 J	0.28 J	0.94 U
Sodium	--	--	--	mg/kg		272	216	413	245	337	745	611	249	746	406	260	352	120	1010	1210
Thallium	--	--	--	mg/kg		0.16 J	0.12 J	0.081 J	0.24 J	0.16 J	0.3 J	0.34 U	0.49	0.43 U	1.8	0.13 J	1.4	0.31 J	0.36 J	0.11 J
Vanadium	--	--	--	mg/kg		28.1	20	15.3	18.1	22.3	32.7	17.8	27.2	18.8	39.1	14.7	41.7	23.5	44.2	20.2
Zinc	**109**	10000	2480	mg/kg		**198**	**323**	29.1	**178**	**351**	**144**	54.8	**305**	36.8	**200**	25.7	**163**	**266**	**575**	47.7

Table 4. Summary of Metals in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	RX-27	RX-28	RX-28	RX-29	RX-29	RX-29	RX-3	RX-3	RX-3	RX-5	RX-5	RX-8	RX-8	SB-21-01	SB-21-01
					Sample Date:	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	09/27/2018	09/27/2018	09/27/2018	09/27/2018	09/27/2018	09/27/2018	09/27/2018	11/10/2021	11/10/2021
					Sample Depth (ft bls):	12 - 14	0 - 2	5 - 7	0 - 2	5 - 7	5 - 7	0.5 - 2.5	0.5 - 2.5	8 - 10	0.5 - 2.5	5 - 7	0.5 - 2.5	8 - 10	2 - 4	4 - 6
					Normal Sample or Field Duplicate:	N	N	N	N	N	FD	N	FD	N	N	N	N	N	N	N
Aluminum	--	--	--	mg/kg		579 J	4140 J	11500 J	1670	6370 J	10000	7660	11500	8190	5610	8240	7090	7380	7180	9210
Antimony	--	--	--	mg/kg		0.94 UJ	0.97 UJ	0.98 UJ	0.91 U	0.17 J	0.26 J	1.3 U	1.4 U	1.1 U	0.96 U	0.99 UJ	0.79 J	1 U	3.2 U	3 U
Arsenic	**13**	16	16	mg/kg		0.15 J	3.7	2.4	5	2.9	5.5	7.2	8.9	1 J	3.7	2	5.7	2.6	**17.9**	4.6
Barium	**350**	400	820	mg/kg		3.3 J	39.2 J	51.2 J	18.8	51.7 J	65.5	118	157	24.1	60.4	29.8	185	48.7	64	61.6
Beryllium	7.2	72	47	mg/kg		0.37 U	0.18 J	0.52	0.15 J	0.23 J	0.36	0.43 J	0.59	0.24 J	0.26 J	0.33 J	0.25 J	0.26 J	0.73 J	0.45 J
Cadmium	**2.5**	4.3	7.5	mg/kg		0.94 U	0.19 J	0.11 J	0.58 J	0.63 J	0.64 J	1.9	1.3 J	1.1 U	0.66 J	0.99 U	2.3	1 U	0.59 J	0.73 J
Calcium	--	--	--	mg/kg		257000 J	64200 J	9120 J	92400	20000 J	19100	24300	40100	182000	63700	39000	38400	33600	60800	72700
Chromium III	30	180	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Hexavalent	1	110	19	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.2 U	2.2 U
Chromium, Total	30	180	--	mg/kg		1.1 J	6.6	15.6	4.3	10.5	19.6	16.4	23.7	10.7	10.4	11.1	14.2	13.2	16.2	19.7
Cobalt	--	--	--	mg/kg		0.3 J	3	6.7	1.8	5.1	6.4	7	8.9	2.3	4.2	5	4	6	6.5	4.4 J
Copper	**50**	270	1720	mg/kg		0.28 J	11.7 J	16.3 J	15.6	33.3 J	24	**192**	**194**	7	22.7	10.8	**473**	26.1	42.7	24.5
Cyanide	27	27	40	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.23 U	0.24 U
Iron	--	--	--	mg/kg		1910	7930	15200	4970	11400	16100	17100	19600	6690	11100	11500	17100	11600	17800	12500
Lead	**63**	400	450	mg/kg		1.7 J	39.6 J	8.2 J	15.5	42 J	**74**	**175**	**207**	23.9	52.2	4.8	**263**	30.1	**89.5**	47.2
Magnesium	--	--	--	mg/kg		151000 J	16100 J	13000 J	42400	3930 J	5390	15000	22600	94300	23700	27800	14500	18600	28100 J	37500 J
Manganese	1600	2000	2000	mg/kg		97.3	129	299	85.8	158	211	268	355	167	185	315	177	146	171	170
Mercury	**0.18**	0.81	0.73	mg/kg		0.034	0.075	0.018	0.071	0.17	0.15	**0.55**	**0.76**	0.036	0.086	0.019 U	**0.22**	0.012 J	**0.31**	0.09
Nickel	**30**	310	130	mg/kg		0.77 J	11	13.5	9.7	15.6	16.4	20	25.2	6.1	11.6	10.9	15	12.9	17.1	13.1
Potassium	--	--	--	mg/kg		457	646	598	466	918	994	1270	2000	2340	866	913	913	1260	1240	4000
Selenium	3.9	180	4	mg/kg		1.2 U	0.23 J	0.21 J	1.1 U	0.2 J	0.27 J	0.58 J	0.75 J	5.3 U	4.8 U	4.9 U	0.46 J	0.38 J	0.68 J	3.8 U
Silver	2	180	8.3	mg/kg		0.94 U	0.97 U	0.98 U	0.91 U	0.93 U	0.1 J	1.3 U	1.4 U	1.1 U	0.96 U	0.99 U	0.96 U	1 U	3.2 U	3 U
Sodium	--	--	--	mg/kg		74.6 J	197	747	146	165	181	423	631	1010	311	1050	314	429	163 J	313
Thallium	--	--	--	mg/kg		0.37 U	0.052 J	0.096 J	0.071 J	0.077 J	0.12 J	0.33 J	0.42 J	0.42 U	0.38 U	0.39 U	0.13 J	0.41 U	0.73 J	0.19 J
Vanadium	--	--	--	mg/kg		2.3	38.1	28.5	32.7	19	29.6	24.9	35.7	11.5	21.1	14.3	20.4	16.1	31.3	18.7
Zinc	**109**	10000	2480	mg/kg		3.2 J	42.6	53.4	46.1	**191**	**116**	**693**	**718**	38.2	75.5	33.9	**898**	**138**	**178 J**	**274 J**

Table 4. Summary of Metals in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	SB-21-01	SB-21-01	SB-21-01	SB-21-02	SB-21-02	SB-21-02	SB-21-02	SB-21-03	SB-21-03	SB-21-03	SB-21-03	SB-21-04	SB-21-04	SB-21-04
					Sample Date:	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/10/2021	11/11/2021	11/11/2021	11/11/2021	11/09/2021	11/09/2021	11/12/2021
					Sample Depth (ft bls):	6 - 8	10 - 12	13 - 15	4 - 6	6 - 8	8 - 10	8 - 10	0 - 2	3 - 5	5 - 7	7 - 9	0 - 2	0 - 2	4 - 6
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	FD	N	N	N	N	N	FD	N
Aluminum	--	--	--	mg/kg		9290	7390	8930	7830	4420	4890	2080	8070	4820	16700	12200	12000	7660	5450	6150
Antimony	--	--	--	mg/kg		1.1 U	1.1 U	1.1 U	1.1 U	0.26 J	0.99 U	1 U	0.99 U	0.34 J	1.1 U	0.35 J	1.1 U	0.26 J	0.23 J	0.27 J
Arsenic	**13**	16	16	mg/kg		1.4	1.6	1.8	1.4	5.3	1.2	0.57 J	1.4	9.3	5.5	4	1.3	5.9 J	4.5 J	3.8
Barium	**350**	400	820	mg/kg		39.5	25.7	39.5	15.9	63.3	12.2	12.9	32.5	94.8	88.2	98.2	25.4	152	135	95.3
Beryllium	7.2	72	47	mg/kg		0.39 J	0.35 J	0.41 J	0.33 J	0.23 J	0.22 J	0.085 J	0.26 J	0.41 J	1	0.86	0.44	0.42	0.29 J	0.36 J
Cadmium	**2.5**	4.3	7.5	mg/kg		1.1 U	1.1 U	1.1 U	1.1 U	0.97 J	0.99 U	1 U	0.23 J	0.88 J	1.4	2.5	1.1 U	8.1	8	2.5
Calcium	--	--	--	mg/kg		1270	10000	7680	1120	60200	191000	225000	126000	46900	52800	68500	134000	31800	20400	35700
Chromium III	30	180	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Hexavalent	1	110	19	mg/kg		2.3 U	2.3 U	2.4 U	2.3 U	2.2 U	2.1 U	2.2 U	2.1 U	2.2 U	2.3 U	2.2 U	2.2 U	2.3 UJ	2.2 UJ	2.3 U
Chromium, Total	30	180	--	mg/kg		14.7	10.7	12.7	12	11.1	5.8	2.8	12	9.2	28.9	20.4	12.2	14.5 J	10.5 J	16.5
Cobalt	--	--	--	mg/kg		3.7	4.4	4.2	5	3.8	1 J	0.66 J	3	4.6	8.1	7.8	3.7	7.3	4.6	5.2
Copper	**50**	270	1720	mg/kg		6.5	8.6	7.9	8.9	31.5	2.5	1.3 J	11.1	**100**	20.8	29.5	10.3	**71.4 J**	**66.6 J**	**59.9**
Cyanide	27	27	40	mg/kg		0.28 U	0.28 U	0.25 U	0.26 U	0.26 U	0.23 U	0.26 U	0.23 U	5.4 J	0.28 U	0.26 U	0.23 U	0.23 UJ	0.21 UJ	0.24 U
Iron	--	--	--	mg/kg		10800	11300	11900	9910	9390	3800	2410	7560	8610	19600	18200	11000	16000	9610	10900
Lead	**63**	400	450	mg/kg		12.9	11.2	5.9	8.2	**154**	3.1	2.2	28.6	**113**	48.8	**138**	4.7	**115 J**	**142 J**	**115**
Magnesium	--	--	--	mg/kg		2530	7470	6900	2700	25500	98300	106000	67600	11800 J	40100	47600	73200	9070 J	5840 J	6580
Manganese	1600	2000	2000	mg/kg		167	128	577	93.4	144	101	80	143	138 J	441	667	301	221	151	194
Mercury	**0.18**	0.81	0.73	mg/kg		0.021	0.018 U	0.012 J	0.016 J	0.069	0.029	0.02	0.028	**0.3 J**	0.071	0.051	0.05	2.6	**0.25**	**0.24**
Nickel	**30**	310	130	mg/kg		9.4	10.1	10	9.5	14.2	2.9 B	2.3	8	15.3	17.5	15.8	8.9	**66 J**	**44.4 J**	26.6
Potassium	--	--	--	mg/kg		595	972	677	956	815	2400	1510	4630	722	3310	1070	9940	1300 J	920 J	1260
Selenium	3.9	180	4	mg/kg		1.4 U	1.4 U	1.4 U	1.4 U	0.32 J	1.2 U	1.2 U	1.2 U	0.62 J	0.27 J	0.47 J	1.3 U	0.63 J	0.51 J	0.43 J
Silver	2	180	8.3	mg/kg		1.1 U	1.1 U	1.1 U	1.1 U	0.11 J	0.99 U	1 U	0.99 U	0.28 J	1.1 U	0.12 J	1.1 U	0.39 J	0.51 J	0.4 J
Sodium	--	--	--	mg/kg		180	173	193	975	189	527	152	529	612	1210	1030	1160	365	295	382
Thallium	--	--	--	mg/kg		0.077 J	0.071 J	0.08 J	0.081 J	0.12 J	0.056 J	0.049 J	0.099 J	0.19 J	0.39 J	0.33 J	0.15 J	0.17 J	0.13 J	0.13 J
Vanadium	--	--	--	mg/kg		16	13.6	16.4	11.6	28.1	6.2	5.8	15.9	19.5	33.8	28.1	19.7	33.9	30.7	42.5
Zinc	**109**	10000	2480	mg/kg		23.9	22.7	25.1	29.7	**139**	31	13.5	43.5	**124 J**	**669**	**663**	40.5	**535**	**393**	**207**

Table 4. Summary of Metals in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	SB-21-04	SB-21-04	SB-21-05	SB-21-05	SB-21-05	SB-21-06	SB-21-06	SB-21-06	SB-21-06	SB-21-06	SB-21-07	SB-21-07	SB-21-07	SB-21-07	SB-21-08
					Sample Date:	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/12/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021
					Sample Depth (ft bls):	6 - 8	8 - 10	4 - 6	6 - 8	8 - 10	0 - 2	2 - 4	2 - 4	4 - 6	6 - 8	0 - 2	2 - 4	4 - 6	6 - 8	0 - 2
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N
Aluminum	--	--	--	mg/kg		6040	8650	3420	3540	2290	10100	8410	10600	11600	4230	5860	9290	5630	12600	5360
Antimony	--	--	--	mg/kg		1 U	0.99 U	0.6 J	0.42 J	1 U	0.19 J	0.39 J	3.2 U	0.37 J	0.96 U	0.65 J	0.86 U	0.2 J	1 U	0.53 J
Arsenic	**13**	16	16	mg/kg		1.8	0.94 J	3.7	0.8 J	0.71 J	6.4	8	10.1	7.7	0.82 J	7.3 J	3.9	2.9	0.89 J	5.2
Barium	**350**	400	820	mg/kg		24.1	16.9	184	16	8.5	94.4	82	94.2	85.3	14.1	189	57.7	29.7	25.6	136
Beryllium	7.2	72	47	mg/kg		0.27 J	0.35 J	0.16 J	0.12 J	0.097 J	0.47	0.46	0.45 J	0.61	0.17 J	0.36	0.41	0.24 J	0.26 J	0.29 J
Cadmium	**2.5**	4.3	7.5	mg/kg		1 U	0.99 U	0.95 J	1.3	0.12 J	0.49 J	1.1	0.83 J	0.59 J	0.96 U	**4.8**	0.24 J	0.4 J	0.12 J	**2.7**
Calcium	--	--	--	mg/kg		75700	139000	16900	210000	226000	70400	82000	84000	19700	157000	59000 J	64500	29500	194000	39500
Chromium III	30	180	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Hexavalent	1	110	19	mg/kg		2.2 U	2.1 U	2.2 U	2.1 U	2.1 U	2.2 U	2.1 U	2.2 U	2.4 U	2.1 U	2.2 UJ	2.2 UJ	2.1 U	2.2 U	2.1 U
Chromium, Total	30	180	--	mg/kg		8.9	10.1	15.2	4.8	3.2	20	16.7	28.3	23	5.3	16.7 J	15.7	10.2	14.1	12
Cobalt	--	--	--	mg/kg		4.1	3.1	2.3	1.1 J	1.3 J	6.8	5.9	7.5	8	2	4.9	6.6	3.4	4	4.4
Copper	**50**	270	1720	mg/kg		7.2	5.9	**106**	5.9	1.1 J	36	47.2	**54.9**	42.1	4.2	**164**	26.9	13.8	8.9	**98.5**
Cyanide	27	27	40	mg/kg		0.25 U	0.21 U	0.27 U	0.24 U	0.24 U	0.26 U	0.26 U	0.26 U	0.27 U	0.24 U	0.26 R	0.21 UJ	0.24 U	0.24 U	0.23 U
Iron	--	--	--	mg/kg		9520	8980	13300	3660	3380	15400	15400	18000	19300	4450	13800	15000	8800	7950	10700 J
Lead	**63**	400	450	mg/kg		4.2	4.4	**631**	13.5	2.7	**102**	**146**	**140**	**89.1**	4.9	**299 J**	60.1	36.2	3.2	**212**
Magnesium	--	--	--	mg/kg		39200	75600	7480	92500	74700	12000 J	13600 J	15300 J	13400 J	85000	21400	11600	19500	83700	13900
Manganese	1600	2000	2000	mg/kg		259	194	105	90.7	95.9	228	252	280	216	100	222	286	194	133	163
Mercury	**0.18**	0.81	0.73	mg/kg		0.023	0.034	**0.42**	**1.1**	0.017 U	0.13	**0.24**	**0.21**	0.12	0.018	**0.8**	0.1	0.078	0.055	**0.39**
Nickel	**30**	310	130	mg/kg		8.1	6.1	7.9	3.5	2.8	17.5	17.9	21.3	18.6	4	25.3 J	18.3	8.5	8.4	19.9
Potassium	--	--	--	mg/kg		2070	5890	608	1700	2170	2810	1710	2260	1300	3490	1140 J	1490	614	12300	1090
Selenium	3.9	180	4	mg/kg		1.3 U	1.2 U	0.22 J	1.3 U	1.3 U	0.75 J	1 J	1.4 J	1.6	1.2 U	0.62 J	0.26 J	1.3 U	1.3 U	0.48 J
Silver	2	180	8.3	mg/kg		1 U	0.99 U	0.24 J	1 U	1 U	0.14 J	0.23 J	3.2 U	0.17 J	0.96 U	1.7	0.085 J	1 U	1 U	0.49 J
Sodium	--	--	--	mg/kg		371	733	140	427	196	778	461	654	1050	290	544	687	936	842	353
Thallium	--	--	--	mg/kg		0.07 J	0.1 J	0.051 J	0.062 J	0.046 J	0.28 J	0.28 J	0.3 J	0.25 J	0.04 J	0.18 J	0.11 J	0.08 J	0.19 J	0.15 J
Vanadium	--	--	--	mg/kg		10.9	18.3	11.2	5.5	3.4	35.3	32	37.6	25.4	8.5	37.2	27.9	12.9	15.2	38.7
Zinc	**109**	10000	2480	mg/kg		25.3	21	**524**	**360**	22.5	**132 J**	**157 J**	**175 J**	**198 J**	19.4	**480**	68.1	53.6	25.1	**303**

Table 4. Summary of Metals in Soil, 408 West 207th Street, New York, New York

			Sample Designation:		SB-21-08	SB-21-08	SB-21-08	SB-21-09	SB-21-09	SB-21-09	SB-21-09
			Sample Date:		11/12/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021
			Sample Depth (ft bls):		3 - 5	5 - 7	7 - 9	0 - 2	4 - 6	6 - 8	8 - 10
			Normal Sample or Field Duplicate:		N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units							
Aluminum	--	--	--	mg/kg	6800	9270	6290	6910	6100	6610	8040
Antimony	--	--	--	mg/kg	0.27 J	1 U	1 U	1.1	0.43 J	1 U	1 U
Arsenic	**13**	16	16	mg/kg	2.9	3.7	0.35 J	6.9	4.2	1.8	0.57 J
Barium	**350**	400	820	mg/kg	126	58.6	13.9	**363**	152	29.5	17.6
Beryllium	7.2	72	47	mg/kg	0.32 J	0.5	0.26 J	0.37	0.34 J	0.32 J	4.2 U
Cadmium	**2.5**	4.3	7.5	mg/kg	0.69 J	0.17 J	1 U	**53**	**33.6**	0.16 J	0.36 J
Calcium	--	--	--	mg/kg	56500	17100	168000	26800	63700	17500	168000
Chromium III	30	180	--	mg/kg	NA	NA	NA	NA	NA	NA	NA
Chromium, Hexavalent	1	110	19	mg/kg	2.2 U	2.2 U	2.1 U	2.3 UJ	2.3 U	2.2 U	2.2 U
Chromium, Total	30	180	--	mg/kg	12.2	15.6	6.4	15.6	13.2	11.6	7.8
Cobalt	--	--	--	mg/kg	4.3	4.5	1.7 J	7.9	5.7	5.1	2.3
Copper	**50**	270	1720	mg/kg	48.9	15.1	3.3	**325**	**172**	12.7	5.1
Cyanide	27	27	40	mg/kg	0.23 U	0.26 U	0.24 U	0.23 UJ	0.26 U	0.26 U	0.26 U
Iron	--	--	--	mg/kg	11100	13000	5790	15600	13000	12100	6290
Lead	**63**	400	450	mg/kg	**226**	**72.2**	4	**623**	**133**	5.8	2.7
Magnesium	--	--	--	mg/kg	29300	15300	94400	11000	26200	12900	85500
Manganese	1600	2000	2000	mg/kg	191	381	139	309	227	305	171
Mercury	**0.18**	0.81	0.73	mg/kg	0.16	0.043	0.071	**1.3**	**1.4**	0.036	0.04
Nickel	**30**	310	130	mg/kg	12.6	10.7	3.3	**48.2**	25.7	11.6	4.7
Potassium	--	--	--	mg/kg	1480	812	6010	1090	1220	1060	6600
Selenium	3.9	180	4	mg/kg	0.23 J	0.2 J	1.3 U	1.1	0.53 J	1.3 U	1.3 U
Silver	2	180	8.3	mg/kg	0.1 J	1 U	1 U	0.59 J	0.23 J	1 U	1 U
Sodium	--	--	--	mg/kg	312	822	271	432	224	266	600
Thallium	--	--	--	mg/kg	0.048 J	0.046 J	0.4 U	0.16 J	0.09 J	0.41 U	0.048 J
Vanadium	--	--	--	mg/kg	21	17.9	9	43.2	31	15.7	11.4
Zinc	**109**	10000	2480	mg/kg	**569**	**111**	34.2	**2560**	**887**	32.8	**164**

Table 5. Summary of Polychlorinated Biphenyls in Soil, 408 West 207th Street, New York, New York

Sample Designation:					F1	F1	F1	F2	F2	F2	F3	F3	F3	G1	G1	G1	G2	G2	G2
Sample Date:					11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/11/2021	11/11/2021	11/10/2021	11/12/2021	11/12/2021
Sample Depth (ft bls):					0 - 4.5	4.5 - 10.5	10.5 - 16.5	0 - 4	4 - 10	10 - 16	0 - 3.25	3.5 - 9.5	9.5 - 15.5	0 - 3	3 - 9	9 - 15	0 - 3	3 - 9	9 - 15
Normal Sample or Field Duplicate:					N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units															
PCB-1016 (Aroclor 1016)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U	0.077 U
PCB-1221 (Aroclor 1221)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U	0.077 U
PCB-1232 (Aroclor 1232)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U	0.077 U
PCB-1242 (Aroclor 1242)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U	0.077 U
PCB-1248 (Aroclor 1248)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U	0.077 U
PCB-1254 (Aroclor 1254)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U	0.077 U
PCB-1260 (Aroclor 1260)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.053 J	0.074 U	0.077 U
PCB-1262 (Aroclor 1262)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U	0.077 U
PCB-1268 (Aroclor 1268)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U	0.077 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.053 J	0.074 U	0.077 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	G3	G3	MR-11	MR-11	MR-9	MR-9	RX-26	RX-26	RX-27	RX-27	RX-27	RX-28	RX-28	RX-29
					Sample Date:	11/09/2021	11/11/2021	07/23/2018	07/23/2018	07/26/2018	07/26/2018	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021
					Sample Depth (ft bls):	0 - 2.5	2.5 - 8.5	8.5 - 14.5	0.25 - 0.75	5 - 6.5	1 - 1.5	8 - 9	3 - 5	5 - 7	3 - 5	7 - 9	12 - 14	0 - 2	5 - 7	0 - 2
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
PCB-1016 (Aroclor 1016)	--	--	--	mg/kg		0.077 U	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U
PCB-1221 (Aroclor 1221)	--	--	--	mg/kg		0.077 U	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U
PCB-1232 (Aroclor 1232)	--	--	--	mg/kg		0.077 U	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U
PCB-1242 (Aroclor 1242)	--	--	--	mg/kg		0.077 U	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	0.26	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U
PCB-1248 (Aroclor 1248)	--	--	--	mg/kg		0.077 U	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U
PCB-1254 (Aroclor 1254)	--	--	--	mg/kg		0.077 U	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U
PCB-1260 (Aroclor 1260)	--	--	--	mg/kg		0.064 J	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	0.13	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U
PCB-1262 (Aroclor 1262)	--	--	--	mg/kg		0.077 U	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U
PCB-1268 (Aroclor 1268)	--	--	--	mg/kg		0.077 U	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	0.088 U	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	mg/kg		0.064 J	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 UJ	0.076 UJ	**0.39**	0.074 U	0.078 U	0.073 U	0.076 U	0.072 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	RX-29	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-02	SB-21-02	SB-21-02	SB-21-02	SB-21-03	SB-21-03	SB-21-03
					Sample Date:	01/12/2021	01/12/2021	11/10/2021	11/10/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/10/2021	11/11/2021	11/11/2021
					Sample Depth (ft bls):	5 - 7	5 - 7	2 - 4	4 - 6	6 - 8	10 - 12	13 - 15	15 - 17	4 - 6	6 - 8	8 - 10	8 - 10	0 - 2	3 - 5	5 - 7
					Normal Sample or Field Duplicate:	N	FD	N	N	N	N	N	N	N	N	N	FD	N	N	N
PCB-1016 (Aroclor 1016)	--	--	--	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U	0.073 U
PCB-1221 (Aroclor 1221)	--	--	--	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U	0.073 U
PCB-1232 (Aroclor 1232)	--	--	--	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U	0.073 U
PCB-1242 (Aroclor 1242)	--	--	--	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U	0.073 U
PCB-1248 (Aroclor 1248)	--	--	--	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U	0.073 U
PCB-1254 (Aroclor 1254)	--	--	--	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.16	0.077 U	0.066 J
PCB-1260 (Aroclor 1260)	--	--	--	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U	0.073 U
PCB-1262 (Aroclor 1262)	--	--	--	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U	0.073 U
PCB-1268 (Aroclor 1268)	--	--	--	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	0.075 U	0.077 U	0.073 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	mg/kg		0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U	**0.16**	0.077 U	0.066 J

Table 5. Summary of Polychlorinated Biphenyls in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	Sample Designation:	SB-21-03	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-05	SB-21-05	SB-21-05	SB-21-06	SB-21-06	SB-21-06	SB-21-06	SB-21-06	SB-21-07
					Sample Date:	11/11/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/12/2021	11/09/2021
					Sample Depth (ft bls):	7 - 9	0 - 2	0 - 2	4 - 6	6 - 8	8 - 10	4 - 6	6 - 8	8 - 10	0 - 2	2 - 4	2 - 4	4 - 6	6 - 8	0 - 2
					Normal Sample or Field Duplicate:	N	N	FD	N	N	N	N	N	N	N	N	FD	N	N	N
PCB-1016 (Aroclor 1016)	--	--	--	mg/kg		0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.072 U
PCB-1221 (Aroclor 1221)	--	--	--	mg/kg		0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.072 U
PCB-1232 (Aroclor 1232)	--	--	--	mg/kg		0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.072 U
PCB-1242 (Aroclor 1242)	--	--	--	mg/kg		0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.072 U
PCB-1248 (Aroclor 1248)	--	--	--	mg/kg		0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.072 U
PCB-1254 (Aroclor 1254)	--	--	--	mg/kg		0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.072 U
PCB-1260 (Aroclor 1260)	--	--	--	mg/kg		0.074 U	0.088	0.074 U	0.096	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.082
PCB-1262 (Aroclor 1262)	--	--	--	mg/kg		0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.072 U
PCB-1268 (Aroclor 1268)	--	--	--	mg/kg		0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.072 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	mg/kg		0.074 U	0.088	0.074 U	0.096	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U	0.074 U	0.081 U	0.069 U	0.082

Table 5. Summary of Polychlorinated Biphenyls in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	SB-21-07	SB-21-07	SB-21-07	SB-21-08	SB-21-08	SB-21-08	SB-21-08	SB-21-09	SB-21-09	SB-21-09	SB-21-09
				Sample Date:	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/12/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021
				Sample Depth (ft bls):	2 - 4	4 - 6	6 - 8	0 - 2	3 - 5	5 - 7	7 - 9	0 - 2	4 - 6	6 - 8	8 - 10
				Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units											
PCB-1016 (Aroclor 1016)	--	--	--	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
PCB-1221 (Aroclor 1221)	--	--	--	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
PCB-1232 (Aroclor 1232)	--	--	--	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
PCB-1242 (Aroclor 1242)	--	--	--	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
PCB-1248 (Aroclor 1248)	--	--	--	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
PCB-1254 (Aroclor 1254)	--	--	--	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
PCB-1260 (Aroclor 1260)	--	--	--	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.11	0.061 J	0.074 U	0.072 U
PCB-1262 (Aroclor 1262)	--	--	--	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
PCB-1268 (Aroclor 1268)	--	--	--	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U	0.072 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	mg/kg	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	**0.11**	0.061 J	0.074 U	0.072 U

Table 6. Summary of Pesticides and Herbicides in Soil, 408 West 207th Street, New York, New York

			Sample Designation:		F1	F1	F1	F2	F2	F2	F3	F3	F3	G1	G1	G1	G2	G2
			Sample Date:		11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/11/2021	11/11/2021	11/10/2021	11/12/2021
			Sample Depth (ft bls):		0 - 4.5	4.5 - 10.5	10.5 - 16.5	0 - 4	4 - 10	10 - 16	0 - 3.25	3.5 - 9.5	9.5 - 15.5	0 - 3	3 - 9	9 - 15	0 - 3	3 - 9
			Normal Sample or Field Duplicate:		N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	mg/kg	0.035 U	0.035 U	0.035 U	0.037 U	0.035 U	0.042 U	0.037 U	0.037 U	0.041 U	0.036 U	0.037 UT	0.04 UT	0.037 U	0.037 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	mg/kg	0.035 U	0.035 U	0.035 U	0.037 U	0.035 U	0.042 U	0.037 U	0.037 U	0.041 U	0.036 U	0.037 U	0.04 U	0.037 U	0.037 U
Aldrin	0.005	0.097	0.19	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.02	mg/kg	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U	0.0025 U	0.0022 U	0.0022 U	0.0025 U	0.0022 U	0.0022 U	0.0024 U	0.0022 U	0.0022 U
Alpha Endosulfan	2.4	24	102	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.09	mg/kg	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U	0.0025 U	0.0022 U	0.0022 U	0.0025 U	0.0022 U	0.0022 U	0.0024 U	0.0022 U	0.0022 U
Beta Endosulfan	2.4	24	102	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U
Chlordane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane (Technical)	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U
cis-Chlordane	0.094	4.2	2.9	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.25	mg/kg	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U	0.0025 U	0.0022 U	0.0022 U	0.0025 U	0.0022 U	0.0022 U	0.0024 U	0.0022 U	0.0022 U
Dieldrin	0.005	0.2	0.1	mg/kg	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U	0.0025 U	0.0022 U	0.0022 U	0.0025 U	0.0022 U	0.0022 U	0.0024 U	0.0022 U	0.0022 U
Endosulfan Sulfate	2.4	24	1000	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 UJ	0.008 UJ	0.0075 U	0.0074 U
Endrin	0.014	11	0.06	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U
Endrin Aldehyde	--	--	--	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U
Endrin Ketone	--	--	--	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U
Gamma Bhc (Lindane)	0.1	1.3	0.1	mg/kg	0.0021 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U	0.0025 U	0.0022 U	0.0022 U	0.0025 U	0.0022 U	0.0022 U	0.0024 U	0.0022 U	0.0022 U
Heptachlor	0.042	2.1	0.38	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U
Heptachlor Epoxide	--	--	--	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U
Methoxychlor	--	--	--	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 UJ	0.008 UJ	0.0075 U	0.0074 U
4,4'-DDD	0.0033	13	14	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0033 J	0.0074 U
4,4'-DDE	**0.0033**	8.9	17	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0025 J	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	**0.004 J**	0.0074 U
4,4'-DDT	**0.0033**	7.9	136	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	**0.012**	0.0075 U	0.0083 U	0.0073 U	0.0074 UJ	0.008 UJ	**0.0046 J**	0.0074 U
Silvex (2,4,5-TP)	3.8	100	3.8	mg/kg	0.035 U	0.035 U	0.035 U	0.037 U	0.035 U	0.042 U	0.037 U	0.037 U	0.041 U	0.036 U	0.037 UT	0.04 UT	0.037 U	0.037 U
Toxaphene	--	--	--	mg/kg	0.07 U	0.071 U	0.071 U	0.074 U	0.071 U	0.085 U	0.075 U	0.075 U	0.083 U	0.073 U	0.074 U	0.08 U	0.075 U	0.074 U
trans-Chlordane	--	--	--	mg/kg	0.007 U	0.0071 U	0.0071 U	0.0074 U	0.0071 U	0.0085 U	0.0075 U	0.0075 U	0.0083 U	0.0073 U	0.0074 U	0.008 U	0.0075 U	0.0074 U

Table 6. Summary of Pesticides and Herbicides in Soil, 408 West 207th Street, New York, New York

			Sample Designation:		G2	G3	G3	G3	MR-11	MR-11	MR-9	MR-9	RX-26	RX-26	RX-27	RX-27	RX-27	RX-28
			Sample Date:		11/12/2021	11/09/2021	11/11/2021	11/11/2021	07/23/2018	07/23/2018	07/26/2018	07/26/2018	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021
			Sample Depth (ft bls):		9 - 15	0 - 2.5	2.5 - 8.5	8.5 - 14.5	0.25 - 0.75	5 - 6.5	1 - 1.5	8 - 9	3 - 5	5 - 7	3 - 5	7 - 9	12 - 14	0 - 2
			Normal Sample or Field Duplicate:		N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	mg/kg	0.039 U	0.038 U	0.035 UT	0.041 UT	0.04 U	0.039 U	0.037 U	0.036 U	NA	NA	NA	NA	NA	NA
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	mg/kg	0.039 U	0.038 U	0.035 U	0.041 U	0.04 U	0.039 U	0.037 U	0.036 U	NA	NA	NA	NA	NA	NA
Aldrin	0.005	0.097	0.19	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.02	mg/kg	0.0023 U	0.0023 U	0.0021 U	0.0025 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0024 U	0.0023 U	0.0026 UJ	0.0022 UJ	0.0023 U	0.0022 U
Alpha Endosulfan	2.4	24	102	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.09	mg/kg	0.0023 U	0.0023 U	0.0021 U	0.0025 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0024 U	0.0023 U	0.0026 UJ	0.0022 UJ	0.0023 U	0.0022 UJ
Beta Endosulfan	2.4	24	102	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 UJ	0.0076 UJ	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
Chlordane	--	--	--	mg/kg	NA	NA	NA	NA	0.081 U	0.079 U	0.075 U	0.072 U	NA	NA	NA	NA	NA	NA
Chlordane (Technical)	--	--	--	mg/kg	0.077 U	0.077 U	0.071 U	0.083 U	NA	NA	NA	NA	0.081 U	0.076 U	0.088 UJ	0.074 UJ	0.078 U	0.073 U
cis-Chlordane	0.094	4.2	2.9	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.25	mg/kg	0.0023 U	0.0023 U	0.0021 U	0.0025 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0024 U	0.0023 U	0.0026 UJ	0.0022 UJ	0.0023 U	0.0022 U
Dieldrin	0.005	0.2	0.1	mg/kg	0.0023 U	0.0023 U	0.0021 U	0.0025 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0024 U	0.0023 U	0.0026 UJ	0.0022 UJ	0.0023 U	0.0022 U
Endosulfan Sulfate	2.4	24	1000	mg/kg	0.0077 U	0.0077 U	0.0071 UJ	0.0083 UJ	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
Endrin	0.014	11	0.06	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
Endrin Aldehyde	--	--	--	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 UJ
Endrin Ketone	--	--	--	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
Gamma Bhc (Lindane)	0.1	1.3	0.1	mg/kg	0.0023 U	0.0023 U	0.0021 U	0.0025 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0024 U	0.0023 U	0.0026 UJ	0.0022 UJ	0.0023 U	0.0022 U
Heptachlor	0.042	2.1	0.38	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
Heptachlor Epoxide	--	--	--	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
Methoxychlor	--	--	--	mg/kg	0.0077 U	0.0077 U	0.0071 UJ	0.0083 UJ	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 UJ	0.0076 UJ	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
4,4'-DDD	0.0033	13	14	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
4,4'-DDE	**0.0033**	8.9	17	mg/kg	0.0077 U	**0.012**	0.0071 U	0.0083 U	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U
4,4'-DDT	**0.0033**	7.9	136	mg/kg	0.0077 U	**0.02**	0.0071 UJ	0.0083 UJ	0.0081 U	0.0079 U	0.0075 U	0.0072 U	0.0081 UJ	0.0076 UJ	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 UJ
Silvex (2,4,5-TP)	3.8	100	3.8	mg/kg	0.039 U	0.038 U	0.035 UT	0.041 UT	0.04 U	0.039 U	0.037 U	0.036 U	NA	NA	NA	NA	NA	NA
Toxaphene	--	--	--	mg/kg	0.077 U	0.077 U	0.071 U	0.083 U	0.081 U	0.079 U	0.075 U	0.072 U	0.081 U	0.076 U	0.088 UJ	0.074 UJ	0.078 U	0.073 U
trans-Chlordane	--	--	--	mg/kg	0.0077 U	0.0077 U	0.0071 U	0.0083 U	NA	NA	NA	NA	0.0081 U	0.0076 U	0.0088 UJ	0.0074 UJ	0.0078 U	0.0073 U

Table 6. Summary of Pesticides and Herbicides in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	RX-28	RX-29	RX-29	RX-29	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-01	SB-21-02	SB-21-02	SB-21-02	SB-21-02
				Sample Date:	01/12/2021	01/12/2021	01/12/2021	01/12/2021	11/10/2021	11/10/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021
				Sample Depth (ft bls):	5 - 7	0 - 2	5 - 7	5 - 7	2 - 4	4 - 6	6 - 8	10 - 12	13 - 15	15 - 17	4 - 6	6 - 8	8 - 10	8 - 10
				Normal Sample or Field Duplicate:	N	N	N	FD	N	N	N	N	N	N	N	N	N	FD
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	mg/kg	NA	NA	NA	NA	0.036 U	0.037 UT	0.039 UJ	0.039 UJ	0.04 U	0.038 U	0.037 UJ	0.035 UT	0.036 UJ	0.035 UJ
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	mg/kg	NA	NA	NA	NA	0.036 U	0.037 U	0.039 U	0.039 U	0.04 U	0.038 U	0.037 U	0.035 U	0.036 U	0.035 U
Aldrin	0.005	0.097	0.19	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.02	mg/kg	0.0023 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0024 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U
Alpha Endosulfan	2.4	24	102	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.09	mg/kg	0.0023 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0024 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U
Beta Endosulfan	2.4	24	102	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
Chlordane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane (Technical)	--	--	--	mg/kg	0.076 U	0.072 U	0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U
cis-Chlordane	0.094	4.2	2.9	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.25	mg/kg	0.0023 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0024 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U
Dieldrin	0.005	0.2	0.1	mg/kg	0.0023 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0024 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U
Endosulfan Sulfate	2.4	24	1000	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 UJ	0.0074 UJ	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
Endrin	0.014	11	0.06	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
Endrin Aldehyde	--	--	--	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
Endrin Ketone	--	--	--	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 UT	0.0074 UT	0.0079 U	0.0078 U	0.008 UJ	0.0077 UJ	0.0074 U	0.007 U	0.0073 U	0.0071 U
Gamma Bhc (Lindane)	0.1	1.3	0.1	mg/kg	0.0023 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0024 U	0.0023 U	0.0024 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U
Heptachlor	0.042	2.1	0.38	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
Heptachlor Epoxide	--	--	--	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
Methoxychlor	--	--	--	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 UJ	0.0074 UJ	0.0079 U	0.0078 U	0.008 UJ	0.0077 UJ	0.0074 U	0.007 U	0.0073 U	0.0071 U
4,4'-DDD	0.0033	13	14	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
4,4'-DDE	**0.0033**	8.9	17	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U
4,4'-DDT	**0.0033**	7.9	136	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 UJ	0.0074 UJ	0.0079 U	0.0078 U	0.008 UJ	0.0077 UJ	0.0074 U	0.007 U	0.0073 U	0.0071 U
Silvex (2,4,5-TP)	3.8	100	3.8	mg/kg	NA	NA	NA	NA	0.036 U	0.037 U	0.039 UT	0.039 UT	0.04 U	0.038 U	0.037 UT	0.035 UT	0.036 UT	0.035 UT
Toxaphene	--	--	--	mg/kg	0.076 U	0.072 U	0.075 U	0.074 U	0.073 U	0.074 U	0.079 U	0.078 U	0.08 U	0.077 U	0.074 U	0.07 U	0.073 U	0.071 U
trans-Chlordane	--	--	--	mg/kg	0.0076 U	0.0072 U	0.0075 U	0.0074 U	0.0073 U	0.0074 U	0.0079 U	0.0078 U	0.008 U	0.0077 U	0.0074 U	0.007 U	0.0073 U	0.0071 U

Table 6. Summary of Pesticides and Herbicides in Soil, 408 West 207th Street, New York, New York

			Sample Designation:	SB-21-03	SB-21-03	SB-21-03	SB-21-03	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-05	SB-21-05	SB-21-05	SB-21-06	SB-21-06
			Sample Date:	11/10/2021	11/11/2021	11/11/2021	11/11/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/10/2021	11/10/2021
			Sample Depth (ft bls):	0 - 2	3 - 5	5 - 7	7 - 9	0 - 2	0 - 2	4 - 6	6 - 8	8 - 10	4 - 6	6 - 8	8 - 10	0 - 2	2 - 4
			Normal Sample or Field Duplicate:	N	N	N	N	N	FD	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units													
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	mg/kg	0.037 U	0.038 UJ	0.036 UJ	0.037 UJ	0.038 U	0.037 U	0.038 UT	0.036 UT	0.036 UT	0.037 UT	0.035 UT	0.035 UT	0.037 U	0.036 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	mg/kg	0.037 U	0.038 U	0.036 U	0.037 U	0.038 U	0.037 U	0.038 UT	0.036 UT	0.036 UT	0.037 UJ	0.035 UJ	0.035 UJ	0.037 U	0.036 U
Aldrin	0.005	0.097	0.19	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.02	mg/kg	0.0022 UJ	0.0023 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U
Alpha Endosulfan	2.4	24	102	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.09	mg/kg	0.0022 UJ	0.0023 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U
Beta Endosulfan	2.4	24	102	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U
Chlordane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane (Technical)	--	--	--	mg/kg	0.075 U	0.077 U	0.073 U	0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U
cis-Chlordane	0.094	4.2	2.9	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.005 J	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.25	mg/kg	0.0022 UJ	0.0023 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U
Dieldrin	0.005	0.2	0.1	mg/kg	0.0022 UJ	0.0023 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U
Endosulfan Sulfate	2.4	24	1000	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 UJ	0.0071 UJ
Endrin	0.014	11	0.06	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U
Endrin Aldehyde	--	--	--	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 UJ	0.0072 UJ	0.0072 UJ	0.0074 UJ	0.0071 UJ	0.007 UJ	0.0074 U	0.0071 U
Endrin Ketone	--	--	--	mg/kg	0.0075 UT	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 UT	0.0071 UT
Gamma Bhc (Lindane)	0.1	1.3	0.1	mg/kg	0.0022 UJ	0.0023 U	0.0022 U	0.0022 U	0.0023 U	0.0022 U	0.0023 U	0.0022 U	0.0021 U	0.0022 U	0.0021 U	0.0021 U	0.0022 U	0.0021 U
Heptachlor	0.042	2.1	0.38	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U
Heptachlor Epoxide	--	--	--	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U
Methoxychlor	--	--	--	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 UJ	0.0071 UJ
4,4'-DDD	0.0033	13	14	mg/kg	0.0075 U	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U
4,4'-DDE	**0.0033**	8.9	17	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	**0.0043 J**	0.0032 J	**0.0041 J**	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U
4,4'-DDT	**0.0033**	7.9	136	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0076 U	0.0074 U	**0.0065 JP**	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	**0.024 J**	0.0071 UJ
Silvex (2,4,5-TP)	3.8	100	3.8	mg/kg	0.037 U	0.038 UT	0.036 UT	0.037 UT	0.038 U	0.037 U	0.038 UT	0.036 UT	0.036 UT	0.037 UT	0.035 UT	0.035 UT	0.037 U	0.036 U
Toxaphene	--	--	--	mg/kg	0.075 U	0.077 U	0.073 U	0.074 U	0.076 U	0.074 U	0.077 U	0.072 U	0.072 U	0.074 U	0.071 U	0.07 U	0.074 U	0.071 U
trans-Chlordane	--	--	--	mg/kg	0.0075 UJ	0.0077 U	0.0073 U	0.0074 U	0.0041 J	0.0074 U	0.0077 U	0.0072 U	0.0072 U	0.0074 U	0.0071 U	0.007 U	0.0074 U	0.0071 U

Table 6. Summary of Pesticides and Herbicides in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	SB-21-06	SB-21-06	SB-21-06	SB-21-07	SB-21-07	SB-21-07	SB-21-07	SB-21-08	SB-21-08	SB-21-08	SB-21-08	SB-21-09	SB-21-09	SB-21-09
				Sample Date:	11/10/2021	11/10/2021	11/12/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/12/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021
				Sample Depth (ft bls):	2 - 4	4 - 6	6 - 8	0 - 2	2 - 4	4 - 6	6 - 8	0 - 2	3 - 5	5 - 7	7 - 9	0 - 2	4 - 6	6 - 8
				Normal Sample or Field Duplicate:	FD	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units														
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	mg/kg	0.037 U	0.04 U	0.034 UT	0.036 U	0.036 U	0.035 UT	0.036 UT	0.036 U	0.036 UT	0.037 UT	0.035 UT	0.038 U	0.039 UT	0.037 UT
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	mg/kg	0.037 U	0.04 U	0.034 UT	0.036 U	0.036 U	0.035 UJ	0.036 UJ	0.036 U	0.036 UT	0.037 UT	0.035 UT	0.038 U	0.039 UT	0.01 JTP
Aldrin	0.005	0.097	0.19	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.0076 U	0.0078 U	0.0074 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.02	mg/kg	0.0022 U	0.0024 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0021 UJ	0.0022 U	0.0022 U	0.0021 U	0.0023 U	0.0023 U	0.0022 U
Alpha Endosulfan	2.4	24	102	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.0076 U	0.0078 U	0.0074 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.09	mg/kg	0.0022 U	0.0024 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0021 UJ	0.0022 U	0.0022 U	0.0021 U	0.0023 U	0.0023 U	0.0022 U
Beta Endosulfan	2.4	24	102	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.0076 U	0.0078 U	0.0074 U
Chlordane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane (Technical)	--	--	--	mg/kg	0.074 U	0.081 U	0.069 U	0.072 U	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U
cis-Chlordane	0.094	4.2	2.9	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.014	0.0078 U	0.0074 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.25	mg/kg	0.0022 U	0.0024 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0021 UJ	0.0022 U	0.0022 U	0.0021 U	0.0023 U	0.0023 U	0.0022 U
Dieldrin	0.005	0.2	0.1	mg/kg	0.0022 U	0.0024 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0021 UJ	0.0022 U	0.0022 U	0.0021 U	0.0023 U	0.0023 U	0.0022 U
Endosulfan Sulfate	2.4	24	1000	mg/kg	0.0074 UJ	0.0081 UJ	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.0076 U	0.0078 U	0.0074 U
Endrin	0.014	11	0.06	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.0076 U	0.0078 U	0.0074 U
Endrin Aldehyde	--	--	--	mg/kg	0.0074 U	0.0081 U	0.0069 UJ	0.0072 U	0.0073 U	0.0071 UJ	0.0073 UJ	0.0072 UJ	0.0073 UJ	0.0074 UJ	0.0071 UJ	0.0076 U	0.0078 UJ	0.0074 UJ
Endrin Ketone	--	--	--	mg/kg	0.0074 UT	0.0081 UT	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UT	0.0073 U	0.0074 U	0.0071 U	0.0076 U	0.0078 U	0.0074 U
Gamma Bhc (Lindane)	0.1	1.3	0.1	mg/kg	0.0022 U	0.0024 U	0.0021 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0021 UJ	0.0022 U	0.0022 U	0.0021 U	0.0023 U	0.0023 U	0.0022 U
Heptachlor	0.042	2.1	0.38	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.0076 U	0.0078 U	0.0074 U
Heptachlor Epoxide	--	--	--	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.0076 U	0.0078 U	0.0074 U
Methoxychlor	--	--	--	mg/kg	0.0074 UJ	0.0081 UJ	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.0076 U	0.0078 U	0.0074 U
4,4'-DDD	0.0033	13	14	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.0026 J	0.0078 U	0.0074 U
4,4'-DDE	**0.0033**	8.9	17	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	**0.03**	**0.0099**	0.0074 U
4,4'-DDT	**0.0033**	7.9	136	mg/kg	0.0074 UJ	0.0081 UJ	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	**0.068**	**0.028**	0.0074 U
Silvex (2,4,5-TP)	3.8	100	3.8	mg/kg	0.037 U	0.04 U	0.034 UT	0.036 U	0.036 U	0.035 UT	0.036 UT	0.036 U	0.036 UT	0.037 UT	0.035 UT	0.038 U	0.039 UT	0.037 UT
Toxaphene	--	--	--	mg/kg	0.074 U	0.081 U	0.069 U	0.072 U	0.073 U	0.071 U	0.073 U	0.072 U	0.073 U	0.074 U	0.071 U	0.076 U	0.078 U	0.074 U
trans-Chlordane	--	--	--	mg/kg	0.0074 U	0.0081 U	0.0069 U	0.0072 U	0.0073 U	0.0071 U	0.0073 U	0.0072 UJ	0.0073 U	0.0074 U	0.0071 U	0.013	0.0078 U	0.0074 U

Table 6. Summary of Pesticides and Herbicides in Soil, 408 West 207th Street, New York, New York

				Sample Designation:	SB-21-09
				Sample Date:	11/12/2021
				Sample Depth (ft bls):	8 - 10
				Normal Sample or Field Duplicate:	N
Parameter	NYSDEC Part 375 UUSCO	NYSDEC Part 375 RRSCO	NYSDEC Part 375 PGWSCO	Units	
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	mg/kg	0.036 UT
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	mg/kg	0.036 UT
Aldrin	0.005	0.097	0.19	mg/kg	0.0072 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.02	mg/kg	0.0022 U
Alpha Endosulfan	2.4	24	102	mg/kg	0.0072 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.09	mg/kg	0.0022 U
Beta Endosulfan	2.4	24	102	mg/kg	0.0072 U
Chlordane	--	--	--	mg/kg	NA
Chlordane (Technical)	--	--	--	mg/kg	0.072 U
cis-Chlordane	0.094	4.2	2.9	mg/kg	0.0072 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.25	mg/kg	0.0022 U
Dieldrin	0.005	0.2	0.1	mg/kg	0.0022 U
Endosulfan Sulfate	2.4	24	1000	mg/kg	0.0072 U
Endrin	0.014	11	0.06	mg/kg	0.0072 U
Endrin Aldehyde	--	--	--	mg/kg	0.0072 UJ
Endrin Ketone	--	--	--	mg/kg	0.0072 U
Gamma Bhc (Lindane)	0.1	1.3	0.1	mg/kg	0.0022 U
Heptachlor	0.042	2.1	0.38	mg/kg	0.0072 U
Heptachlor Epoxide	--	--	--	mg/kg	0.0072 U
Methoxychlor	--	--	--	mg/kg	0.0072 U
4,4'-DDD	0.0033	13	14	mg/kg	0.0072 U
4,4'-DDE	**0.0033**	8.9	17	mg/kg	0.0072 U
4,4'-DDT	**0.0033**	7.9	136	mg/kg	0.0072 U
Silvex (2,4,5-TP)	3.8	100	3.8	mg/kg	0.036 UT
Toxaphene	--	--	--	mg/kg	0.072 U
trans-Chlordane	--	--	--	mg/kg	0.0072 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Unrestricted Use GV	NYSDEC Restricted Residential GV	NYSDEC Protection of Groundwater GV	Units	SB-21-01 11/10/2021 2 - 4 N	SB-21-01 11/10/2021 4 - 6 N	SB-21-01 11/11/2021 6 - 8 N	SB-21-01 11/11/2021 10 - 12 N	SB-21-01 11/11/2021 13 - 15 N	SB-21-01 11/11/2021 15 - 17 N	SB-21-02 11/11/2021 4 - 6 N	SB-21-02 11/11/2021 6 - 8 N	SB-21-02 11/11/2021 8 - 10 N	SB-21-02 11/11/2021 8 - 10 FD	SB-21-03 11/10/2021 0 - 2 N	SB-21-03 11/11/2021 3 - 5 N	SB-21-03 11/11/2021 5 - 7 N
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	µg/kg	2.09 UJ	2.02 U	2.15 U	2.18 U	2.17 U	2.26 U	2.18 UJ	1.95 U	2.17 U	2.1 U	2.22 U	2.08 U	2.12 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	µg/kg	2.09 U	2.02 U	2.15 U	2.18 U	2.17 U	2.26 U	2.18 UJ	1.95 U	2.17 U	2.1 U	2.22 U	2.08 U	2.12 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	µg/kg	2.09 U	2.02 U	2.15 U	2.18 U	2.17 U	2.26 U	2.18 U	1.95 U	2.17 U	2.1 U	2.22 U	2.08 U	2.12 U
Perfluorobutanoic Acid	--	--	--	µg/kg	2.09 U	2.02 U	2.15 U	2.18 U	2.17 U	2.26 U	2.18 U	1.95 U	2.17 U	2.1 U	2.22 U	2.08 U	2.12 U
Perfluorodecane Sulfonic Acid	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	1.25	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorodecanoic acid (PFDA)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorododecanoic acid (PFDoA)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorohexanoic acid (PFHxA)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorononanoic acid (PFNA)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorooctanesulfonic acid (PFOS)	0.88	44	3.7	µg/kg	0.27 J	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorooctanoic acid (PFOA)	0.66	33	1.1	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	µg/kg	0.21 J	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	µg/kg	0.63 U	0.61 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.59 U	0.65 U	0.63 U	0.67 U	0.63 U	0.63 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	µg/kg	3.13 U	3.03 U	3.23 U	3.27 U	3.25 U	3.39 U	3.27 U	2.93 UJ	3.26 U	3.16 U	3.34 U	3.13 U	3.17 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	µg/kg	2.09 U	2.02 U	2.15 U	2.18 U	2.17 U	2.26 U	2.18 U	1.95 U	2.17 U	2.1 U	2.22 U	2.08 U	2.12 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Unrestricted Use GV	NYSDEC Restricted Residential GV	NYSDEC Protection of Groundwater GV	Units	SB-21-03	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-04	SB-21-05	SB-21-05	SB-21-05	SB-21-06	SB-21-06	SB-21-06	SB-21-06
Sample Date:					11/11/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/12/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021
Sample Depth (ft bls):					7 - 9	0 - 2	0 - 2	4 - 6	6 - 8	8 - 10	4 - 6	6 - 8	8 - 10	0 - 2	2 - 4	2 - 4	4 - 6
Normal Sample or Field Duplicate:					N	N	FD	N	N	N	N	N	N	N	N	FD	N
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	µg/kg	2.01 U	2.21 U	2.18 U	2.27 UJ	2.03 U	2.07 U	2.09 U	1.93 U	1.96 U	2.15 U	2.06 U	2.09 U	2.26 UJ
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	µg/kg	2.01 U	2.21 U	2.18 UJ	2.27 U	2.03 U	2.07 U	2.09 U	1.93 U	1.96 U	2.15 U	2.06 U	2.09 U	2.26 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	µg/kg	2.01 U	2.21 U	2.18 U	2.27 U	2.03 U	2.07 U	2.09 U	1.93 U	1.96 U	2.15 U	2.06 U	2.09 U	2.26 U
Perfluorobutanoic Acid	--	--	--	µg/kg	2.01 U	2.21 U	2.18 U	2.27 U	2.03 U	2.07 U	2.09 U	1.93 U	1.96 U	2.15 U	2.06 U	2.09 U	2.26 U
Perfluorodecane Sulfonic Acid	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluorodecanoic acid (PFDA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluorododecanoic acid (PFDoA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluorohexanoic acid (PFHxA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluorononanoic acid (PFNA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluorooctanesulfonic acid (PFOS)	0.88	44	3.7	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.25 J	0.37 J	0.63 U	0.68 U
Perfluorooctanoic acid (PFOA)	0.66	33	1.1	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	µg/kg	0.6 U	0.66 U	0.66 U	0.68 U	0.61 U	0.62 U	0.63 U	0.58 U	0.59 U	0.65 U	0.62 U	0.63 U	0.68 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	µg/kg	3.01 U	3.32 UJ	3.28 UJ	3.41 U	3.04 U	3.11 U	3.14 U	2.9 UJ	2.94 U	3.23 U	3.09 U	3.13 U	3.4 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	µg/kg	2.01 U	2.21 U	2.18 U	2.27 U	2.03 U	2.07 U	2.09 U	1.93 U	1.96 U	2.15 U	2.06 U	2.09 U	2.26 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 408 West 207th Street, New York, New York

Parameter	NYSDEC Unrestricted Use GV	NYSDEC Restricted Residential GV	NYSDEC Protection of Groundwater GV	Units	Sample Designation:	SB-21-06	SB-21-07	SB-21-07	SB-21-07	SB-21-07	SB-21-08	SB-21-08	SB-21-08	SB-21-08	SB-21-09	SB-21-09	SB-21-09	SB-21-09
					Sample Date:	11/12/2021	11/09/2021	11/09/2021	11/12/2021	11/12/2021	11/10/2021	11/12/2021	11/12/2021	11/12/2021	11/09/2021	11/12/2021	11/12/2021	11/12/2021
					Sample Depth (ft bls):	6 - 8	0 - 2	2 - 4	4 - 6	6 - 8	0 - 2	3 - 5	5 - 7	7 - 9	0 - 2	4 - 6	6 - 8	8 - 10
					Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N	N	N	N	N
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	µg/kg		2.13 U	2.05 U	2.14 U	1.93 U	2.15 U	2.14 U	2.18 U	2.31 U	2.1 U	2.23 U	2.23 UJ	2.06 U	2.26 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	µg/kg		2.13 U	2.05 U	2.14 U	1.93 U	2.15 U	2.14 U	2.18 U	2.31 U	2.1 U	2.23 U	2.23 U	2.06 U	2.26 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	µg/kg		2.13 U	2.05 U	2.14 U	1.93 U	2.15 U	2.14 U	2.18 U	2.31 U	2.1 U	2.23 U	2.23 U	2.06 U	2.26 U
Perfluorobutanoic Acid	--	--	--	µg/kg		2.13 U	2.05 U	2.14 U	1.93 U	2.15 U	2.14 U	2.18 U	2.31 U	2.1 U	2.23 U	2.23 U	2.06 U	2.26 U
Perfluorodecane Sulfonic Acid	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.88	0.67 U	0.62 U	0.68 U
Perfluorodecanoic acid (PFDA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluorododecanoic acid (PFDoA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluorohexanoic acid (PFHxA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluorononanoic acid (PFNA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluorooctanesulfonic acid (PFOS)	0.88	44	3.7	µg/kg		0.64 U	0.21 J	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.23 J	0.67 U	0.62 U	0.68 U
Perfluorooctanoic acid (PFOA)	0.66	33	1.1	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	µg/kg		0.64 U	0.62 U	0.64 U	0.58 U	0.64 U	0.64 U	0.65 U	0.69 U	0.63 U	0.67 U	0.67 U	0.62 U	0.68 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	µg/kg		3.19 U	3.08 U	3.21 UJ	2.9 U	3.22 U	3.2 U	3.27 U	3.46 U	3.14 UJ	3.34 U	3.35 U	3.09 U	3.39 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	µg/kg		2.13 U	2.05 U	2.14 U	1.93 U	2.15 U	2.14 U	2.18 U	2.31 U	2.1 U	2.23 U	2.23 U	2.06 U	2.26 U

Table 8. Summary of Volatile Organic Compounds in Groundwater, 408 West 207th Street, New York, New York

Sample Designation:			MR-9	RX-2	MW-21-01	MW-21-02	MW-21-03	MW-21-03
Sample Date:			08/02/2018	09/27/2018	11/19/2021	11/19/2021	11/19/2021	11/19/2021
Normal Sample or Field Duplicate:			N	N	N	N	N	FD
Parameter	NYSDEC AWQSGVs	Units						
1,1,1-Trichloroethane (TCA)	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5	µg/L	1 U	1 UT	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	5	µg/L	1 U	1 U	1 UJ	1 UJ	1 UJ	1 UJ
1,1,2-Trichloroethane	1	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	5	µg/L	1 U	1.2	1.3	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	0.04	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	3	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	0.6	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene (Mesitylene)	5	µg/L	1 U	4	0.39 J	1 U	1 U	1 U
1,3-Dichlorobenzene	3	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	3	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dioxane (P-Dioxane)	0.35	µg/L	50 UJ	50 U	NA	NA	NA	NA
2-Hexanone	50	µg/L	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	50	µg/L	5 U	21 J	5 U	5 U	5 U	5 U
Benzene	**1**	µg/L	1 U	**54 J**	**23**	1 U	1 U	1 U
Bromochloromethane	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	50	µg/L	1 U	1 UJ	1 U	1 U	1 U	1 U
Bromomethane	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	60	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	5	µg/L	1 U	0.97 J	1 U	1 U	1 U	1 U
Chloroform	**7**	µg/L	**8.2**	1 U	1 U	1 U	1 U	1 U
Chloromethane	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,3-Dichloropropene	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Cyclohexane	--	µg/L	1 UJ	36	14	1 U	1 U	1 U
Dibromochloromethane	50	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	**5**	µg/L	1 U	**28**	**11**	1 U	1 U	1 U
Isopropylbenzene (Cumene)	**5**	µg/L	1 U	**280**	**150**	1 U	1 U	1 U
m,p-Xylene	**5**	µg/L	1 U	**7.1**	**7.4**	1 U	1 U	1 U
Methyl Acetate	--	µg/L	5 UJ	5 U	5 U	5 U	5 U	5 U
Methyl Ethyl Ketone (2-Butanone)	50	µg/L	5 U	14	5 U	5 U	5 U	5 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	µg/L	5 U	5 U	5 U	5 U	5 U	5 U
Methylcyclohexane	--	µg/L	1 U	72	35	1 U	1 U	1 U
Methylene Chloride	5	µg/L	0.52 J	1 U	1 U	1 U	1 U	1 U
N-Butylbenzene	**5**	µg/L	1 U	**45**	**17**	1 U	1 U	1 U
N-Propylbenzene	**5**	µg/L	1 U	**740 J**	**230**	1 U	1 U	1 U
O-Xylene (1,2-Dimethylbenzene)	5	µg/L	1 U	1.5	1.5	1 U	1 U	1 U

Table 8. Summary of Volatile Organic Compounds in Groundwater, 408 West 207th Street, New York, New York

		Sample Designation:	MR-9	RX-2	MW-21-01	MW-21-02	MW-21-03	MW-21-03
		Sample Date:	08/02/2018	09/27/2018	11/19/2021	11/19/2021	11/19/2021	11/19/2021
		Normal Sample or Field Duplicate:	N	N	N	N	N	FD
Parameter	NYSDEC AWQSGVs	Units						
Sec-Butylbenzene	**5**	µg/L	1 U	**28**	**12**	1 U	1 U	1 U
Styrene	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
T-Butylbenzene	5	µg/L	1 U	2.4	1.9	1 U	1 U	1 U
Tert-Butyl Methyl Ether	10	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethylene (PCE)	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	**5**	µg/L	1 U	**5.5**	2.2	1 U	1 U	1 U
Trans-1,2-Dichloroethene	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Trans-1,3-Dichloropropene	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethylene (TCE)	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	5	µg/L	1 U	1 U	1 UJ	1 UJ	1 UJ	1 UJ
Vinyl Chloride	2	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Xylenes	**5**	µg/L	2 U	**8.7**	**8.9**	2 U	2 U	2 U

Table 9. Summary of Semivolatile Organic Compounds in Groundwater, 408 West 207th Street, New York, New York

Parameter	NYSDEC AWQSGVs	Units	MR-9 08/02/2018 N Total	RX-2 09/27/2018 N Total	MW-21-01 11/19/2021 N Total	MW-21-01 11/19/2021 N Dissolved	MW-21-02 11/19/2021 N Total	MW-21-02 11/19/2021 N Dissolved	MW-21-03 11/19/2021 N Total	MW-21-03 11/19/2021 N Dissolved	MW-21-03 11/19/2021 FD Total	MW-21-03 11/19/2021 FD Dissolved
1,2,4,5-Tetrachlorobenzene	5	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dioxane (P-Dioxane)	0.35	µg/L	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,3,4,6-Tetrachlorophenol	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	5	µg/L	10 U	10 UT	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	10	µg/L	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
2,4-Dinitrotoluene	5	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2,6-Dinitrotoluene	5	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Chloronaphthalene	10	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	--	µg/L	10 U	62	28	35 J	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylphenol (O-Cresol)	--	µg/L	10 U	10 U	10 U	1.8 J	10 U	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	5	µg/L	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
2-Nitrophenol	--	µg/L	10 U	10 UT	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	µg/L	10 UT	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	5	µg/L	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
4,6-Dinitro-2-Methylphenol	--	µg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
4-Bromophenyl Phenyl Ether	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-Methylphenol	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	5	µg/L	10 UT	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl Phenyl Ether	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methylphenol (P-Cresol)	--	µg/L	10 U	10 U	10 U	0.87 J	10 U	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	5	µg/L	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
4-Nitrophenol	--	µg/L	20 U	20 UT	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Acenaphthene	20	µg/L	10 U	10 U	10 UJ	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U
Acenaphthylene	20	µg/L	10 U	10 UT	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetophenone	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Atrazine	7.5	µg/L	2 U	2 UT	2 UT	2 UT	2 UJ	2 UT	2 UT	2 UT	2 UT	2 UT
Benzaldehyde	--	µg/L	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(A)Anthracene	0.002	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzo(A)Pyrene	0	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzo(B)Fluoranthene	0.002	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Benzo(G,H,I)Perylene	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(K)Fluoranthene	0.002	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzyl Butyl Phthalate	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Biphenyl (Diphenyl)	5	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-Chloroethoxy) Methane	5	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bis(2-Chloroisopropyl) Ether	5	µg/L	10 U	10 U	10 UJ	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U
Bis(2-Ethylhexyl) Phthalate	5	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Caprolactam	--	µg/L	10 UJ	10 UT	10 UJ	10 U	10 UJ	10 UJ	10 UJ	10 U	10 UJ	10 U
Carbazole	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	0.002	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U

Table 9. Summary of Semivolatile Organic Compounds in Groundwater, 408 West 207th Street, New York, New York

		Sample Designation:	MR-9	RX-2	MW-21-01	MW-21-01	MW-21-02	MW-21-02	MW-21-03	MW-21-03	MW-21-03	MW-21-03
		Sample Date:	08/02/2018	09/27/2018	11/19/2021	11/19/2021	11/19/2021	11/19/2021	11/19/2021	11/19/2021	11/19/2021	11/19/2021
		Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	FD	FD
		Total or Dissolved:	Total	Total	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Parameter	NYSDEC AWQSGVs	Units										
Cresols, M & P	--	µg/L	10 U	10 U	10 U	0.84 J	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz(A,H)Anthracene	--	µg/L	1 U	1 U	1 U	1 UJ	1 UJ	1 UJ	1 U	1 UJ	1 U	1 UJ
Dibenzofuran	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl Phthalate	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dimethyl Phthalate	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Di-N-Butyl Phthalate	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Di-N-Octylphthalate	--	µg/L	10 UJ	10 UT	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	0.04	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Hexachlorobutadiene	0.5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Hexachlorocyclopentadiene	5	µg/L	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	5	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Indeno(1,2,3-C,D)Pyrene	0.002	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Isophorone	50	µg/L	10 U	10 UT	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	**10**	µg/L	10 U	**90**	10	10 J	2 U	2 U	2 U	2 U	2 U	2 U
Nitrobenzene	0.4	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
N-Nitrosodi-N-Propylamine	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
N-Nitrosodiphenylamine	50	µg/L	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	1	µg/L	20 U	20 U	20 UJ	20 U	20 U	20 U	20 UJ	20 U	20 UJ	20 U
Phenanthrene	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenol	1	µg/L	10 U	10 UT	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Pyrene	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Table 10. Summary of Metals in Groundwater, 408 West 207th Street, New York, New York

Sample Designation:			MR-9	RX-2	MW-21-01	MW-21-01	MW-21-02	MW-21-02	MW-21-03	MW-21-03	MW-21-03	MW-21-03
Sample Date:			08/02/2018	09/27/2018	11/19/2021	11/19/2021	11/19/2021	11/19/2021	11/19/2021	11/19/2021	11/19/2021	11/19/2021
Normal Sample or Field Duplicate:			N	N	N	N	N	N	N	N	FD	FD
Total or Dissolved:			Total	Total	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Parameter	NYSDEC AWQSGVs	Units										
Aluminum	--	µg/L	149	8870	521	40 U	111	40 U	25.3 J	40 U	76.3	40 U
Antimony	3	µg/L	2.1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Arsenic	25	µg/L	2.2	16.1	6.3	2.6	0.91 J	2 U	2.2	2.4	3.1	2.2
Barium	1000	µg/L	182	258	208	97.8	154	127	64.1	67	76	67.5
Beryllium	3	µg/L	0.8 U	0.86	0.14 J	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Cadmium	5	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Calcium	--	µg/L	101000	173000	146000	135000	102000	100000	34500	33500	37300	34300
Chromium, Hexavalent	50	µg/L	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Chromium, Total	50	µg/L	4 U	23.4	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Cobalt	--	µg/L	4 U	5.4	0.73 J	4 U	0.73 J	4 U	4 U	4 U	4 U	4 U
Copper	200	µg/L	2.4 J	41.2	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Cyanide	200	µg/L	10 UJ	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Iron	**300**	µg/L	**857**	**19400**	**20000**	120 U	**1430**	120 U	136	120 U	237	120 U
Lead	**25**	µg/L	0.73 J	**209**	7.4	1.2 U	1.9	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Magnesium	**35000**	µg/L	**40500**	**46900**	32400	33400	**35300**	**35600**	15600	14800	15700	14900
Manganese	**300**	µg/L	**424**	**726**	**2400**	**2290**	300	277	115	104	126	106
Mercury	0.7	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100	µg/L	2.9 J	15.1	4 U	4 U	4 U	1.6 J	4 U	4 U	4 U	4 U
Potassium	--	µg/L	34900	28500	21300	20700	32500	31900	25400	24800	27200	25400
Selenium	**10**	µg/L	**11.7**	10 U	2.5 U	1 J	2.8	3.5	4.6	5	4.1	4.5
Silver	50	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Sodium	**20000**	µg/L	**615000**	**335000**	**261000**	**270000**	**592000**	**644000**	**557000**	**491000**	**529000**	**485000**
Thallium	0.5	µg/L	0.8 U	0.38 J	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Vanadium	--	µg/L	1.4 J	20.8	3.5 J	4 U	1.1 J	4 U	4 U	4 U	1.3 J	0.73 J
Zinc	2000	µg/L	6.4 J	101	10.8 J	7.4 J	16 U	16 U	16 U	16 U	16 U	46.1

Table 11. Summary of Polychlorinated Biphenyls in Groundwater, 408 West 207th Street, New York, New York

		Sample Designation:	MR-9	MW-21-01	MW-21-02	MW-21-03	MW-21-03
		Sample Date:	08/02/2018	11/19/2021	11/19/2021	11/19/2021	11/19/2021
		Normal Sample or Field Duplicate:	N	N	N	N	FD
Parameter	NYSDEC AWQSGVs	Units					
PCB-1016 (Aroclor 1016)	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1221 (Aroclor 1221)	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1232 (Aroclor 1232)	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1242 (Aroclor 1242)	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1248 (Aroclor 1248)	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1254 (Aroclor 1254)	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1260 (Aroclor 1260)	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1262 (Aroclor 1262)	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1268 (Aroclor 1268)	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Polychlorinated Biphenyl (PCBs)	0.09	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U

Table 12. Summary of Pesticides and Herbicides in Groundwater, 408 West 207th Street, New York, New York

		Sample Designation:	MR-9	MW-21-01	MW-21-02	MW-21-03	MW-21-03
		Sample Date:	08/02/2018	11/19/2021	11/19/2021	11/19/2021	11/19/2021
		Normal Sample or Field Duplicate:	N	N	N	N	FD
Parameter	NYSDEC AWQSGVs	Units					
2,4-D (Dichlorophenoxyacetic Acid)	50	µg/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Acetic acid, (2,4,5-trichlorophenoxy)-	35	µg/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Aldrin	0	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.01	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Alpha Endosulfan	--	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.04	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Beta Endosulfan	--	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Chlordane	0.05	µg/L	0.5 U	NA	NA	NA	NA
Chlordane (Technical)	--	µg/L	NA	0.5 U	0.5 U	0.5 U	0.5 U
cis-Chlordane	--	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Dieldrin	0.004	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Endosulfan Sulfate	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Endrin	0	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Endrin Aldehyde	5	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Endrin Ketone	5	µg/L	0.02 U	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ
Gamma Bhc (Lindane)	0.05	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Heptachlor	0.04	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Heptachlor Epoxide	0.03	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Methoxychlor	35	µg/L	0.02 U	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ
4,4'-DDD	0.3	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
4,4'-DDE	0.2	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
4,4'-DDT	0.2	µg/L	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Silvex (2,4,5-TP)	0.26	µg/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Toxaphene	0.06	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-Chlordane	0	µg/L	NA	0.02 U	0.02 UJ	0.02 U	0.02 U

Table 13 Summary of Per- and Polyfluoroalkyl Substances in Groundwater, 408 West 207th Street, New York, New York

	Sample Designation:		MW-21-01	MW-21-02	MW-21-03	MW-21-03
	Sample Date:		11/19/2021	11/19/2021	11/19/2021	11/19/2021
	Normal Sample or Field Duplicate:		N	N	N	FD
Parameter	NYSDEC Proposed GVs	Units				
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	ng/L	2.05 U	1.88 U	1.84 U	1.86 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	ng/L	3.07 U	2.82 U	2.75 U	2.79 U
Perfluorobutanesulfonic acid (PFBS)	--	ng/L	4.98	6.16 J	3.07	2.49
Perfluorobutanoic Acid	--	ng/L	81	16.9	6.46	6.41
Perfluorodecane Sulfonic Acid	--	ng/L	2.05 UJ	1.88 U	1.84 U	1.86 U
Perfluorodecanoic acid (PFDA)	--	ng/L	2.05 U	0.8 J	1.84 U	1.86 U
Perfluorododecanoic acid (PFDoA)	--	ng/L	2.05 U	1.88 U	1.84 U	1.86 U
Perfluoroheptane Sulfonate (PFHPS)	--	ng/L	2.05 U	1.88 U	1.84 U	1.86 U
Perfluoroheptanoic acid (PFHpA)	--	ng/L	2.81	20.4	3.41	3.45
Perfluorohexanesulfonic acid (PFHxS)	--	ng/L	1.08 J	4.52	2.12	1.87
Perfluorohexanoic acid (PFHxA)	--	ng/L	4.98	27.1	3.16	3.26
Perfluorononanoic acid (PFNA)	--	ng/L	1.58 J	4.47	1.71 J	1.64 J
Perfluorooctane Sulfonamide (FOSA)	--	ng/L	2.05 U	1.88 U	1.84 U	1.86 U
Perfluorooctanesulfonic acid (PFOS)	**2.7**	ng/L	**7.4**	**23.5**	**7.23**	**7.3**
Perfluorooctanoic acid (PFOA)	**6.7**	ng/L	**7.24**	**31.2**	**9.96**	**9.71**
Perfluoropentanoic Acid (PFPeA)	--	ng/L	8.05	41.3	6.1	5.98
Perfluorotetradecanoic acid (PFTA)	--	ng/L	2.05 UJ	1.88 U	1.84 U	1.86 U
Perfluorotridecanoic Acid (PFTriA)	--	ng/L	2.05 UJ	1.88 U	1.84 U	1.86 U
Perfluoroundecanoic Acid (PFUnA)	--	ng/L	2.05 U	1.88 U	1.84 U	1.86 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	ng/L	3.07 U	2.82 UJ	2.75 UJ	2.79 UJ
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	ng/L	5.12 U	4.7 U	4.59 U	4.66 U

Table 14. Summary of Volatile Organic Compounds in Soil Vapor, 408 West 207th Street, New York, New York

Sample Designation:		V-3	V-5	SV-21-01	SV-21-04	SV-21-05	SV-21-05	SV-21-06
Sample Date:		08/02/2018	08/02/2018	11/16/2021	11/16/2021	11/16/2021	11/16/2021	11/16/2021
Normal Sample or Field Duplicate:		N	N	N	N	N	FD	N
Parameter	Units							
1,1,1-Trichloroethane (TCA)	µg/m^3	13000 U	**6 J**	16 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1,2,2-Tetrachloroethane	µg/m^3	16000 U	19 U	21 U	1.4 U	1.4 U	1.4 U	1.4 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/m^3	18000 U	21 U	23 U	1.5 U	1.5 U	1.5 U	**0.42 J**
1,1,2-Trichloroethane	µg/m^3	13000 U	15 U	16 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1-Dichloroethane	µg/m^3	9300 U	11 U	12 U	0.81 U	0.81 U	0.81 U	0.81 U
1,1-Dichloroethene	µg/m^3	1600 U	1.9 U	2.1 U	0.14 U	0.14 U	0.14 U	0.14 U
1,2,4-Trichlorobenzene	µg/m^3	43000 U	52 U	56 U	3.7 U	3.7 U	3.7 U	3.7 U
1,2,4-Trimethylbenzene	µg/m^3	11000 U	14 U	**5.5 J**	**2**	**1**	**0.42 J**	**1.1**
1,2-Dibromoethane (Ethylene Dibromide)	µg/m^3	18000 U	22 U	23 U	1.5 U	1.5 U	1.5 U	1.5 U
1,2-Dichlorobenzene	µg/m^3	14000 U	17 U	18 U	1.2 U	1.2 U	1.2 U	1.2 U
1,2-Dichloroethane	µg/m^3	9300 U	11 U	12 U	0.81 U	0.81 U	0.81 U	0.81 U
1,2-Dichloropropane	µg/m^3	11000 U	13 U	14 U	0.92 U	0.92 U	0.92 U	0.92 U
1,2-Dichlorotetrafluoroethane	µg/m^3	16000 U	20 U	21 U	1.4 U	1.4 U	1.4 U	1.4 U
1,3,5-Trimethylbenzene (Mesitylene)	µg/m^3	11000 U	14 U	15 U	**0.52 J**	**0.35 J**	0.98 U	**0.29 J**
1,3-Butadiene	µg/m^3	5100 U	**13**	6.6 U	0.44 U	0.44 U	0.44 U	0.44 U
1,3-Dichlorobenzene	µg/m^3	14000 U	17 U	18 U	**1.3**	1.2 U	1.2 U	1.2 U
1,4-Dichlorobenzene	µg/m^3	14000 U	17 U	18 U	1.2 U	1.2 U	1.2 U	1.2 U
1,4-Dioxane (P-Dioxane)	µg/m^3	210000 U	250 U	270 U	18 U	18 U	18 U	18 U
2,2,4-Trimethylpentane	µg/m^3	**1100000**	**39**	**10000**	**2.9**	**30**	**7.8**	**2.4**
2-Chlorotoluene	µg/m^3	12000 U	14 U	16 U	1 U	1 U	1 U	1 U
2-Hexanone	µg/m^3	24000 U	29 U	31 U	2 U	**18**	**3.2**	2 U
4-Ethyltoluene	µg/m^3	11000 U	14 U	15 U	**0.63 J**	**0.27 J**	0.98 U	**0.34 J**
Acetone	µg/m^3	140000 U	170 U	**380**	**47**	**95**	**30**	**20**
Allyl Chloride (3-Chloropropene)	µg/m^3	18000 U	22 U	23 U	1.6 U	1.6 U	1.6 U	1.6 U
Benzene	µg/m^3	**5400 J**	**8.6 J**	**33**	**5.2**	**0.69**	**0.63 J**	**1**
Benzyl Chloride	µg/m^3	12000 UJ	14 UJ	16 U	1 U	1 U	1 U	1 U
Bromodichloromethane	µg/m^3	15000 U	19 U	20 U	1.3 U	1.3 U	1.3 U	1.3 U
Bromoform	µg/m^3	24000 U	29 U	31 U	2.1 U	2.1 U	2.1 U	2.1 U
Bromomethane	µg/m^3	8900 U	11 U	12 U	0.78 U	0.78 U	0.78 U	0.78 U
Butane	µg/m^3	**24000**	**170**	**990**	**6.4**	**9.8**	**3.8**	**7**
Carbon Disulfide	µg/m^3	18000 U	**21 J**	**7.6 J**	**0.41 J**	**1.4 J**	**0.64 J**	**3.1**

Table 14. Summary of Volatile Organic Compounds in Soil Vapor, 408 West 207th Street, New York, New York

Sample Designation:		V-3	V-5	SV-21-01	SV-21-04	SV-21-05	SV-21-05	SV-21-06
Sample Date:		08/02/2018	08/02/2018	11/16/2021	11/16/2021	11/16/2021	11/16/2021	11/16/2021
Normal Sample or Field Duplicate:		N	N	N	N	N	FD	N
Parameter	Units							
Carbon Tetrachloride	µg/m^3	2500 U	3.1 U	3.3 U	**0.26**	0.22 U	**0.35**	**0.32**
Chlorobenzene	µg/m^3	11000 U	13 U	14 U	**0.32 J**	0.92 U	0.92 U	0.92 U
Chlorodifluoromethane	µg/m^3	20000 U	25 U	27 U	**1.1 J**	1.8 U	**0.97 J**	**0.98 J**
Chloroethane	µg/m^3	15000 U	18 U	20 U	1.3 U	1.3 U	1.3 U	1.3 U
Chloroform	µg/m^3	11000 U	**27**	15 U	**0.4 J**	**4.6**	**1.3**	**0.67 J**
Chloromethane	µg/m^3	12000 U	14 U	15 U	**0.87 J**	**0.44 J**	**1**	**0.98 J**
Cis-1,2-Dichloroethylene	µg/m^3	1600 U	1.9 U	3 U	0.2 U	0.2 U	0.2 U	0.2 U
Cis-1,3-Dichloropropene	µg/m^3	10000 U	13 U	14 U	0.91 U	0.91 U	0.91 U	0.91 U
Cyclohexane	µg/m^3	**11000**	**14**	10 U	**0.7**	**0.57 J**	0.69 U	**0.55 J**
Cymene	µg/m^3	13000 U	15 U	16 U	**0.25 J**	1.1 U	1.1 U	1.1 U
Dibromochloromethane	µg/m^3	20000 U	24 U	26 U	1.7 U	1.7 U	1.7 U	1.7 U
Dichlorodifluoromethane	µg/m^3	28000 U	35 U	37 U	**2.1 J**	**1.8 J**	**2.3 J**	**2.2 J**
Dichloroethylenes	µg/m^3	18000 U	22 U	NA	NA	NA	NA	NA
Ethylbenzene	µg/m^3	10000 U	12 U	13 U	**1.7**	**13**	**3.9**	**1.1**
Hexachlorobutadiene	µg/m^3	24000 U	30 U	32 U	2.1 U	2.1 U	2.1 U	2.1 U
Isopropanol	µg/m^3	140000 U	170 U	180 U	**12**	12 U	12 U	**6.4 J**
Isopropylbenzene (Cumene)	µg/m^3	**5300 J**	14 U	15 U	0.98 U	0.98 U	0.98 U	0.98 U
m,p-Xylene	µg/m^3	25000 U	**4.9 J**	**14 J**	**5.6**	**47**	**15**	**3.5**
Methyl Ethyl Ketone (2-Butanone)	µg/m^3	17000 U	**11 J**	**130**	**63**	**350**	**38**	**20**
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	µg/m^3	24000 U	29 U	31 U	**2.2**	2 U	2 U	**1.2 J**
Methyl Methacrylate	µg/m^3	24000 U	29 U	31 U	2 U	2 U	2 U	2 U
Methylene Chloride	µg/m^3	20000 U	24 U	26 U	**3.3**	1.7 U	1.7 U	1.7 U
Naphthalene	µg/m^3	30000 UJ	37 UJ	39 U	2.6 U	2.6 U	2.6 U	2.6 U
N-Butylbenzene	µg/m^3	13000 UJ	15 UJ	16 U	1.1 U	1.1 U	1.1 U	1.1 U
N-Heptane	µg/m^3	**24000**	**160**	12 U	**13**	**3.9**	0.82 U	**8.9**
N-Hexane	µg/m^3	**20000**	**84**	**730**	**5.5**	**2.3**	1.8 U	**4.5**
N-Propylbenzene	µg/m^3	**4500 J**	14 U	15 U	**0.41 J**	0.98 U	0.98 U	0.98 U
O-Xylene (1,2-Dimethylbenzene)	µg/m^3	10000 U	12 U	13 U	**2.2**	**15**	**4.3**	**1.3**
Sec-Butylbenzene	µg/m^3	13000 U	15 U	16 U	1.1 U	1.1 U	1.1 U	1.1 U
Styrene	µg/m^3	9800 U	12 U	13 U	**0.41 J**	0.85 U	0.85 U	0.85 U
T-Butylbenzene	µg/m^3	13000 U	15 U	16 U	1.1 U	1.1 U	1.1 U	1.1 U

Table 14. Summary of Volatile Organic Compounds in Soil Vapor, 408 West 207th Street, New York, New York

Sample Designation:		V-3	V-5	SV-21-01	SV-21-04	SV-21-05	SV-21-05	SV-21-06
Sample Date:		08/02/2018	08/02/2018	11/16/2021	11/16/2021	11/16/2021	11/16/2021	11/16/2021
Normal Sample or Field Duplicate:		N	N	N	N	N	FD	N
Parameter	Units							
Tert-Butyl Alcohol	µg/m^3	170000 U	210 U	230 U	**4.5 J**	**6.5 J**	15 U	15 U
Tert-Butyl Methyl Ether	µg/m^3	8300 U	10 U	11 U	0.72 U	0.72 U	0.72 U	0.72 U
Tetrachloroethylene (PCE)	µg/m^3	16000 U	**26**	20 U	**0.91 J**	**11**	**3**	1.4 U
Tetrahydrofuran	µg/m^3	170000 U	210 U	220 U	15 U	15 U	15 U	15 U
Toluene	µg/m^3	8700 U	**1300**	11 U	**27**	**42**	**15**	**6.7**
Trans-1,2-Dichloroethene	µg/m^3	9100 U	11 U	12 U	0.79 U	0.79 U	0.79 U	0.79 U
Trans-1,3-Dichloropropene	µg/m^3	10000 U	13 U	14 U	0.91 U	0.91 U	0.91 U	0.91 U
Trichloroethylene (TCE)	µg/m^3	2200 U	2.6 U	2.8 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichlorofluoromethane	µg/m^3	13000 U	16 U	17 U	**1.2**	**1.1**	**1.2**	**1.1**
Vinyl Bromide	µg/m^3	10000 U	12 U	13 U	0.87 U	0.87 U	0.87 U	0.87 U
Vinyl Chloride	µg/m^3	1000 U	1.3 U	3 U	0.2 U	0.2 U	0.2 U	0.2 U
Xylenes, Total	µg/m^3	35000 U	43 U	NA	NA	NA	NA	NA

Table 15. Remedial Alternative 1 Remedial Cost Estimate, 408 West 207th Street, New York, New York

Item No.	Description of Environmental Item	Estimated Quantity	Unit	Unit Price	Cost
REMEDIAL ACTION CONTRACTOR FEES					
1	Remediation Facilities, Equipment, Mobilization, Demobilization, Permits, Site Maintenance, Site Security - Remediation and decontamination facilities include trailer, truck cleaning facilities, Fencing, Site Security, etc.	1	LS	$360,800	$360,800
2	Remedial Contractor BCP Expenses - Insurance, Site Security, Site Safety, General Conditions, Remedial Project Management/Coordination, Dust, Odor and Vapor Control	1	LS	$618,700	$618,700
1	Demolition/Site Clearing Required to Support Remediation	1	LS	$140,000	$140,000
4	Soil Excavation, Stockpile and Loading of Material - Accounts for remedial excavation of material containing concentrations exceeding Track 1 Unrestricted Use Soil Cleanup Objectives.	6,200	CY	$58.5	$362,700
5	Transport and Disposal of Excavated Material - Includes transport vehicles and disposal of soil exceeding Track 1 Unrestricted Use Soil Cleanup Objectives.	8,920	TON	$65	$579,800
6	Transport and Disposal of Petroleum Impacted Soil - Includes transport vehicles and disposal of petroleum contaminated soil at a permitted facility. (Northeast portion of the Site with petroleum impacts).	2,610	TON	$105	$274,100
7	Support of Excavation - Support of excavation to reach remedial excavation depths.	1	LS	$793,200	$793,200
8	Dewatering and Water Treatment - Dewatering to reach remedial excavation depths. Includes permitting and discharge fees.	1	LS	$181,800	$181,800
9	Underground Storage Tank (UST) Removal - Registration, cleaning, removal and disposal of any encountered USTs.	1	LS	$105,000	$105,000
REMEDIAL ACTION CONTRACTOR FEES SUBTOTAL					**$3,416,100**
ENGINEERING FEES/SUPPLEMENTAL BCP COSTS					
1	Remedial Investigation/Waste characterization - To delineate nature and extent of contamination and classify material to be excavated for off-site disposal. Also includes preparation of RIR/RAWP.	1	LS	$180,400	$180,400
2	Confirmation Sampling - To confirm Track 1 is achieved. Includes 24 confirmation endpoint samples analyzed for full list of Part 375 parameters and emerging contaminants.	1	LS	$65,400	$65,400
3	Remediation Oversight and CAMP - This cost includes full time field oversight/CAMP implementation and office support, as well as equipment rental fees associated with implementation of CAMP, which will be performed during excavation.	2	MONTH	$40,700	$81,400
4	BCP Engineering Services/BCP Regulatory Coordination/BCP Legal Fees - RAWP development, SOE Design, SWPPP Preparation/Implementation, Legal Support, Construction Manager Regulatory/Team Coordination, Construction Meetings and Construction Administration, Brownfield Cleanup Program Consultation, and Technical Support, Citizens Participation Activities, Final Engineering Report and Site Management Plan	1	LS	$405,900	$405,900
ENGINEERING FEES/SUPPLEMENTAL BCP COSTS SUBTOTAL					**$733,100**
			Total Estimated Cost		**$4,149,200**

Table 16. Remedial Alternative 2 Remedial Cost Estimate, 408 West 207th Street, New York, New York

Item No.	Description of Environmental Item	Estimated Quantity	Unit	Unit Price	Cost
REMEDIAL ACTION CONTRACTOR FEES					
1	Remediation Facilities, Equipment, Mobilization, Demobilization, Permits, Site Maintenance, Site Security- Remediation and decontamination facilities include trailer, truck cleaning facilities, Fencing, Site Security, etc.	1	LS	$228,900	$228,900
2	Remedial Contractor BCP Expenses - Insurance, Site Security, Site Safety, General Conditions, Remedial Project Management/Coordination, Dust, Odor and Vapor Control	1	LS	$392,400	$392,400
3	Demolition/Site Clearing Required to Support Remediation	1	LS	$140,000	$140,000
4	Soil Excavation, Stockpile and Loading of Material - Accounts for remedial excavation of material containing concentrations exceeding Track 2 Restricted Residential Use Soil Cleanup Objectives.	3,932	CY	$58.5	$230,100
5	Transport and Disposal of Excavated Material - Includes transport vehicles and disposal of soil exceeding Track 2 Restricted Residential Use Soil Cleanup Objectives.	5,700	TON	$65	$370,500
6	Transport and Disposal of Petroleum Impacted Soil - Includes transport vehicles and disposal of petroleum contaminated soil at a permitted facility. (Northeast portion of the Site with petroleum impacts).	1,700	TON	$105	$178,500
7	Support of Excavation - Support of excavation to reach remedial excavation depths.	1	LS	$503,100	$503,100
8	Dewatering and Water Treatment - Dewatering to reach remedial excavation depths. Includes permitting and discharge fees.	1	LS	$115,300	$115,300
9	Underground Storage Tank (UST) Removal - Registration, cleaning, removal and disposal of any encountered USTs.	1	LS	$105,000	$105,000
	REMEDIAL ACTION CONTRACTOR FEES SUBTOTAL				**$2,263,800**
ENGINEERING FEES/SUPPLEMENTAL BCP COSTS					
1	Remedial Investigation/Waste characterization - To delineate nature and extent of contamination and classify material to be excavated for off-site disposal. Also includes preparation of RIR/RAWP.	1	LS	$180,400	$180,400
2	Confirmation Sampling - To confirm Track 2 is achieved. Includes 24 confirmation endpoint samples analyzed for full list of Part 375 parameters and emerging contaminants.	1	LS	$65,400	$65,400
3	Remediation Oversight and CAMP- This cost includes full time field oversight/CAMP implementation and office support, as well as equipment rental fees associated with implementation of CAMP, which will be performed during excavation.	1.5	MONTH	$40,700	$61,100
4	BCP Engineering Services/BCP Regulatory Coordination/BCP Legal Fees - RAWP development, SOE Design, SWPPP Preparation/Implementation, Legal Support, Construction Manager Regulatory/Team Coordination, Construction Meetings and Construction Administration, Brownfield Cleanup Program Consultation, and Technical Support, Citizens Participation Activities, Final Engineering Report and Site Management Plan	1	LS	$304,500	$304,500
	ENGINEERING FEES/SUPPLEMENTAL BCP COSTS SUBTOTAL				**$611,400**
			Total Estimated Cost		**$2,875,200**
ANNUAL INSPECTION AND REPORTING COST					
	Annual Inspection of Institutional Controls and Periodic Review Report	1	LS	$10,000	$10,000

Table 17. Summary of Permits/Approvals
408 West 207th Street, New York, New York

Regulatory Agency	Permit
NYCCPC	Uniform Land Use Review Procedure (ULURP)/Rezoning
NYCDEP	Dewatering Permit and Sewer Discharge Permit (for temporary discharge during construction)
NYCDEP	Sewer Certification and Sewer Permit (for new building connection)
NYCDEP	Fire Hydrant Permit
NYCDOB	Demolition Permit
NYCDOB	New Building (NB) Permit
NYCDOB	Fence Permit
NYCDOB	Foundation/Earthwork Permit
NYCDOB	Builder's Paving Plan
NYCDOB	Underground Plumbing Permit
NYCTA	Plan review and no impact determination
NYSDEC	Water Withdrawal Permit

Note: This list only accounts for permits required from the street level and below. Permits for aboveground portions of the building are not listed.

NYCCPC - New York City City Planning Commission
NYCDEP - New York City Department of Environmental Protection
NYCDOB - New York City Department of Buildings
NYCDOT - New York City Department of Transportation
NYCDPR - New York City Department of Parks & Recreation
NYCTA - New York City Transit Authority
NYSDEC - New York State Department of Environmental Conservation

TABLE 18

Project Management/Health and Safety Personnel

Title	Contact	Telephone
Harlem River Ninth Avenue Development LLC (Volunteer)		
Project Manager	Katherine Kelman	646-527-7224
UAG (General Contractor/Soil Remedial Contractor)		
Project Quality Control Officer	Mohamed Mahmoud	347-599-4128
Roux (Environmental Consultant)		
Principal Engineer/Remedial Engineer	Noelle Clarke	631-232-2600
Project Principal	Jessica Taylor	631-232-2600
Senior Engineer	Valerie Sabatasso	631-232-2600
Field Manager/Site Safety Officer	TBD	TBD
Corporate Health and Safety Manager	Brian Hobbs	631-232-2600
Office Health and Safety Manager	TBD	631-232-2600

Emergency Phone Numbers

Emergency Medical Service 911
Police: NYPD 911
Fire: FDNY 911
Hospital: New York-Presbyterian The Allen Hospital 212-932-4000
Urgent Care: City MD Fordham Urgent Care Bronx 718-489-3553
National Response Center 800-424-8802
Poison Control Center 800-222-1222
CHEMTREC® 800-262-8200
Centers for Disease Control 800-232-4636
USEPA (Region II) 212-637-3000
NYSDEC Emergency Spill Response 800-457-7362

Table 19. Track 1 Soil Cleanup Objectives
408 West 207th Street, New York

Parameter	Track 1 Soil Cleanup Objectives[1]
Volatile Organic Compounds (Concentrations in µg/kg)	
1,1,1-Trichloroethane	680
1,1-Dichloroethane	270
1,1-Dichloroethene	330
1,2,4-Trimethylbenzene	3600
1,3,5-Trimethylbenzene	8400
1,2-Dichlorobenzene	1100
1,2-Dichloroethane	20
1,3-Dichlorobenzene	2400
1,4-Dichlorobenzene	1800
1,4-Dioxane	100
2-Butanone (MEK)	120
Acetone	50
Benzene	60
n-Butylbenzene	12000
Carbon tetrachloride	760
Chlorobenzene	1100
Chloroform	370
cis-1,2-Dichloroethene	250
Ethylbenzene	1000
Methylene chloride	50
MTBE	930
n-Propylbenzene	3900
sec-Butylbenzene	11000
tert-Butylbenzene	5900
Tetrachloroethene	1300
Toluene	700
trans-1,2-Dichloroethene	190
Trichloroethene	470
Vinyl chloride	20
Xylenes (total)	260
Semivolatile Organic Compounds (Concentrations in µg/kg)	
1,4-Dioxane	100
2-Methylphenol	330
3&4-Methylphenol	330
Acenaphthene	20000
Acenaphthylene	100000
Anthracene	100000
Benzo[a]anthracene	1000
Benzo[a]pyrene	1000
Benzo[b]fluoranthene	1000
Benzo[g,h,i]perylene	100000
Benzo[k]fluoranthene	800
Chrysene	1000
Dibenzo[a,h]anthracene	330
Dibenzofuran	7000
Fluoranthene	100000
Fluorene	3000
Hexachlorobenzene	330
Indeno[1,2,3-cd]pyrene	500
Naphthalene	12000
Pentachlorophenol	800
Phenanthrene	100000
Phenol	330
Pyrene	100000

Table 19. Track 1 Soil Cleanup Objectives
408 West 207th Street, New York

Parameter	Track 1 Soil Cleanup Objectives[1]
Metals (Concentrations in mg/kg)	
Arsenic	13
Barium	350
Beryllium	7.2
Cadmium	2.5
Chromium, Hexavalent	1
Chromium	30
Copper	50
Cyanide, Total	27
Lead	63
Manganese	1600
Mercury	0.18
Nickel	30
Selenium	3.9
Silver	2
Zinc	109
Pesticides (Concentrations in µg/kg)	
2,4,5-TP	3800
4,4'-DDD	3.3
4,4'-DDE	3.3
4,4'-DDT	3.3
Aldrin	5
alpha-BHC	20
alpha-Chlordane	94
beta-BHC	36
delta-BHC	40
Dieldrin	5
Endosulfan I	2400
Endosulfan II	2400
Endosulfan sulfate	2400
Endrin	14
gamma-BHC (Lindane)	100
Heptachlor	42
Pentachlorophenol	800
Total Polychlorinated Biphenyls (Concentrations in µg/kg)	
Total Polychlorinated Biphenyls	100
Perfluorinated Alkyl Acids (Concentrations in µg/kg)	
1H,1H,2H,2H-PERFLUORODECANESULFONIC ACID (8:2FTS)	--
1H,1H,2H,2H-PERFLUOROOCTANESULFONIC ACID (6:2FTS)	--
N-ETHYL PERFLUOROOCTANESULFONAMIDOACETIC ACID (NETFOSAA)	--
N-METHYL PERFLUOROOCTANESULFONAMIDOACETIC ACID (NMEFOSAA)	--
PERFLUOROBUTANESULFONIC ACID (PFBS)	--
PERFLUOROBUTANOIC ACID (PFBA)	--
PERFLUORODECANESULFONIC ACID (PFDS)	--
PERFLUORODECANOIC ACID (PFDA)	--
PERFLUORODODECANOIC ACID (PFDOA)	--
PERFLUOROHEPTANESULFONIC ACID (PFHPS)	--
PERFLUOROHEPTANOIC ACID (PFHPA)	--
PERFLUOROHEXANESULFONIC ACID (PFHXS)	--
PERFLUOROHEXANOIC ACID (PFHXA)	--
PERFLUORONONANOIC ACID (PFNA)	--
PERFLUOROOCTANESULFONAMIDE (FOSA)	--
PERFLUOROOCTANESULFONIC ACID (PFOS)	0.88 [2]

Table 19. Track 1 Soil Cleanup Objectives
408 West 207th Street, New York

Parameter	Track 1 Soil Cleanup Objectives[1]
PERFLUOROOCTANOIC ACID (PFOA)	0.66 [2]
PERFLUOROPENTANOIC ACID (PFPEA)	--
PERFLUOROTETRADECANOIC ACID (PFTA)	--
PERFLUOROTRIDECANOIC ACID (PFTRDA)	--
PERFLUOROUNDECANOIC ACID (PFUNA)	--
PFOA/PFOS, TOTAL	--

1- Soil cleanup objectives for the Track 1 remedy are the NYSDEC Part 375 Unrestricted Residential Use SCOs.
2 - SCOs for PFOS and PFOA not yet final. The guidance values shown are to be used until SCOs are in effect.
µg/kg - Micrograms per kilogram
mg/kg - Milligrams per kilogram
NYSDEC - New York State Department of Environmental Conservation
SCOs - Soil Cleanup Objectives

Table 20. Proposed Documentation/Confirmation Soil Sample Identifications and Depths
408 West 207th Street, New York, New York

Sample Identification		Grid	Proposed Remedial Excavation Elevation (ft NAVD88)	Proposed Remedial Excavation Depth (ft)	Sample Elevation Interval (ft NAVD88)	Sample Depth Interval (ft bls)
Bottom Confirmation Soil Samples						
1	BCS-21-01	F1	5.5	8	5.5 to 3.5	8 to 10
2	BCS-21-02	F1	5.5	8	5.5 to 3.5	8 to 10
3	BCS-21-03	F1	5.5	8	5.5 to 3.5	8 to 10
4	BCS-21-04	F1	5.5	8	5.5 to 3.5	8 to 10
5	BCS-21-05	F2	11.0	2	11 to 9	2 to 4
6	BCS-21-06	F2	11.0	2	11 to 9	2 to 4
7	BCS-21-07	F2	11.0	2	11 to 9	2 to 4
8	BCS-21-08	F2	11.0	2	11 to 9	2 to 4
9	BCS-21-09	F3	2.5	10	2.5 to 0.5	10 to 12
10	BCS-21-10	F3	2.5	10	2.5 to 0.5	10 to 12
11	BCS-21-11	F3	2.5	10	2.5 to 0.5	10 to 12
12	BCS-21-12	F3	2.5	10	2.5 to 0.5	10 to 12
13	BCS-21-13	G1	-1.0	13	-1 to -3	13 to 15
14	BCS-21-14	G1	-1.0	13	-1 to -3	13 to 15
15	BCS-21-15	G1	-1.0	13	-1 to -3	13 to 15
16	BCS-21-16	G1	-1.0	13	-1 to -3	13 to 15
17	BCS-21-17	G2	5.0	7	5 to 3	7 to 9
18	BCS-21-18	G2	5.0	7	5 to 3	7 to 9
19	BCS-21-19	G2	5.0	7	5 to 3	7 to 9
20	BCS-21-20	G2	5.0	7	5 to 3	7 to 9
21	BCS-21-21	G3	1.5	10	1.5 to -0.5	10 to 12
22	BCS-21-22	G3	1.5	10	1.5 to -0.5	10 to 12
23	BCS-21-23	G3	1.5	10	1.5 to -0.5	10 to 12
24	BCS-21-24	G3	1.5	10	1.5 to -0.5	10 to 12

Notes:

1. All samples will be analyzed for full Part 375 list of parameters and emerging contaminants.

2. The topography of the Site is sloped toward the east. Therefore, the excavation depth required to reach the remedial elevations shown is lower on the east side of the Site compared to the west side of the Site.

3. Confirmation sampling frequency is one sample per 900 square feet. Locations are approximate. All end point samples will be biased toward impacted soil, if any is observed in the vicinity of the proposed location.

ft - feet

NAVD88 - North American Vertical Datum of 1988

bls - below land surface

BCS - Bottom Confirmation Sample

NA - Not applicable

Table 21. Backfill/On-Site Soil Reuse Soil Cleanup Objectives
408 West 207th Street, New York

Parameter	Track 1 Backfill/Soil Reuse Soil Cleanup Objectives[1]
Volatile Organic Compounds (Concentrations in µg/kg)	
1,1,1-Trichloroethane	680
1,1-Dichloroethane	270
1,1-Dichloroethene	330
1,2,4-Trimethylbenzene	3600
1,3,5-Trimethylbenzene	8400
1,2-Dichlorobenzene	1100
1,2-Dichloroethane	20
1,3-Dichlorobenzene	2400
1,4-Dichlorobenzene	1800
1,4-Dioxane	100
2-Butanone (MEK)	120
Acetone	50
Benzene	60
n-Butylbenzene	12000
Carbon tetrachloride	760
Chlorobenzene	1100
Chloroform	370
cis-1,2-Dichloroethene	250
Ethylbenzene	1000
Methylene chloride	50
MTBE	930
n-Propylbenzene	3900
sec-Butylbenzene	11000
tert-Butylbenzene	5900
Tetrachloroethene	1300
Toluene	700
trans-1,2-Dichloroethene	190
Trichloroethene	470
Vinyl chloride	20
Xylenes (total)	260
Semivolatile Organic Compounds (Concentrations in µg/kg)	
1,4-Dioxane	100
2-Methylphenol	330
3&4-Methylphenol	330
Acenaphthene	20000
Acenaphthylene	100000
Anthracene	100000
Benzo[a]anthracene	1000
Benzo[a]pyrene	1000
Benzo[b]fluoranthene	1000
Benzo[g,h,i]perylene	100000
Benzo[k]fluoranthene	800
Chrysene	1000
Dibenzo[a,h]anthracene	330
Dibenzofuran	7000
Fluoranthene	100000
Fluorene	3000
Hexachlorobenzene	330
Indeno[1,2,3-cd]pyrene	500
Naphthalene	12000
Pentachlorophenol	800
Phenanthrene	100000
Phenol	330
Pyrene	100000

Table 21. Backfill/On-Site Soil Reuse Soil Cleanup Objectives
408 West 207th Street, New York

Parameter	Track 1 Backfill/Soil Reuse Soil Cleanup Objectives[1]
Metals (Concentrations in mg/kg)	
Arsenic	13
Barium	350
Beryllium	7.2
Cadmium	2.5
Chromium, Hexavalent	1
Chromium	30
Copper	50
Cyanide, Total	27
Lead	63
Manganese	1600
Mercury	0.18
Nickel	30
Selenium	3.9
Silver	2
Zinc	109
Pesticides (Concentrations in µg/kg)	
2,4,5-TP	3800
4,4'-DDD	3.3
4,4'-DDE	3.3
4,4'-DDT	3.3
Aldrin	5
alpha-BHC	20
alpha-Chlordane	94
beta-BHC	36
delta-BHC	40
Dieldrin	5
Endosulfan I	2400
Endosulfan II	2400
Endosulfan sulfate	2400
Endrin	14
gamma-BHC (Lindane)	100
Heptachlor	42
Pentachlorophenol	800
Total Polychlorinated Biphenyls (Concentrations in µg/kg)	
Total Polychlorinated Biphenyls	100
Perfluorinated Alkyl Acids (Concentrations in µg/kg)	
1H,1H,2H,2H-PERFLUORODECANESULFONIC ACID (8:2FTS)	--
1H,1H,2H,2H-PERFLUOROOCTANESULFONIC ACID (6:2FTS)	--
N-ETHYL PERFLUOROOCTANESULFONAMIDOACETIC ACID (NETFOSAA)	--
N-METHYL PERFLUOROOCTANESULFONAMIDOACETIC ACID (NMEFOSAA)	--
PERFLUOROBUTANESULFONIC ACID (PFBS)	--
PERFLUOROBUTANOIC ACID (PFBA)	--
PERFLUORODECANESULFONIC ACID (PFDS)	--
PERFLUORODECANOIC ACID (PFDA)	--
PERFLUORODODECANOIC ACID (PFDOA)	--
PERFLUOROHEPTANESULFONIC ACID (PFHPS)	--
PERFLUOROHEPTANOIC ACID (PFHPA)	--
PERFLUOROHEXANESULFONIC ACID (PFHXS)	--
PERFLUOROHEXANOIC ACID (PFHXA)	--
PERFLUORONONANOIC ACID (PFNA)	--

Table 21. Backfill/On-Site Soil Reuse Soil Cleanup Objectives
408 West 207th Street, New York

Parameter	Track 1 Backfill/Soil Reuse Soil Cleanup Objectives[1]
PERFLUOROOCTANESULFONAMIDE (FOSA)	--
PERFLUOROOCTANESULFONIC ACID (PFOS)	0.88 [2]
PERFLUOROOCTANOIC ACID (PFOA)	0.66 [2]
PERFLUOROPENTANOIC ACID (PFPEA)	--
PERFLUOROTETRADECANOIC ACID (PFTA)	--
PERFLUOROTRIDECANOIC ACID (PFTRDA)	--
PERFLUOROUNDECANOIC ACID (PFUNA)	--
PFOA/PFOS, TOTAL	--

1- Backfill soil cleanup objectives for the Track 1 remedy are the NYSDEC Part 375 Unrestricted Residential Use SCOs.
2 - SCOs for PFOS and PFOA not yet final. The guidance values shown are to be used until SCOs are in effect.
µg/kg - Micrograms per kilogram
mg/kg - Milligrams per kilogram
NYSDEC - New York State Department of Environmental Conservation
SCOs - Soil Cleanup Objectives

FIGURES

1. Site Location Map
2. Site Plan with Sampling Locations
3. Tax Map
4. Surrounding Land Use
5. Groundwater Contour Map, November 19, 2021
6. Remedial Alternative 1: Track 1 Unrestricted Use Cleanup
7. Remedial Alternative 2: Track 2 Restricted Residential Use Cleanup
8. Truck Routes

QUADRANGLE LOCATION

N

1,000 0 1,000'

Title:

SITE LOCATION MAP

408 WEST 207TH STREET
MANHATTAN, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: D.M.	Date: 01/17/22
Prepared by: M.S.R.	Scale: AS SHOWN
Project Mgr: V.S.	Project: 2477.0008Y000
File: 2477.0008Y138.1.mxd	

FIGURE 1

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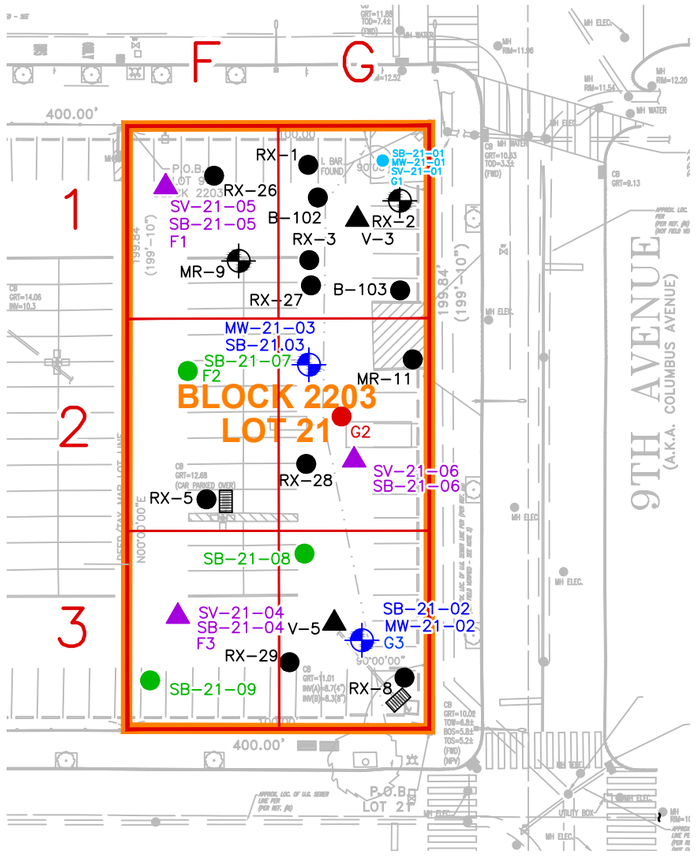

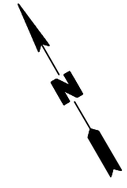

LEGEND

SB-21-02 MW-21-02 G3	SOIL BORING AND MONITORING WELL LOCATION AND DESIGNATION
SB-21-08	SOIL BORING LOCATION AND DESIGNATION
SB-21-04 SV-21-04 F3	SOIL BORING AND SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
SB-21-01 MW-21-01 SV-21-01 G1	SOIL BORING, MONITORING WELL AND SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
B-102	SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY STANTEC, 2011)
MR-09	SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION PREVIOUSLY INSTALLED
V-5	SOIL VAPOR SAMPLING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
RX-5	SOIL BORING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
G2	WASTE CHARACTERIZATION SOIL BORING LOCATION AND DESIGNATION
	CATCH BASIN
	WASTE CHARACTERIZATION GRID
	SITE BOUNDARY

50' 0 50'

Title:

SITE PLAN AND SAMPLING LOCATIONS

408 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: V.S.	Date: 19FEB21	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	2
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y138.01.DWG		

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LEGEND

BCP SITE BOUNDARY

2203 BLOCK
21 LOT

NOTE

1. SOURCE - NEW YORK CITY DEPARTMENT OF INFORMATION AND TECHNOLOGY

75 0 75'

Title:

TAX MAP

408 WEST 207TH STREET
MANHATTAN, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: D.M.	Date: 01/17/22	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	3
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y138.3.mxd		

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10TH AVENUE

W 207TH STREET

W 206TH STREET

9TH AVENUE

N

LEGEND

- BCP SITE BOUNDARY
- MULTI-FAMILY WALK-UP BUILDINGS
- MULTI-FAMILY ELEVATOR BUILDINGS
- MIXED RESIDENTIAL & COMMERCIAL BUILDINGS
- COMMERCIAL & OFFICE BUILDINGS
- INDUSTRIAL & MANUFACTURING
- TRANSPORTATION & UTILITY
- PUBLIC FACILITIES & INSTITUTIONS
- OPEN SPACE & OUTDOOR RECREATION
- PARKING FACILITIES
- VACANT LAND

NOTE

1. SOURCE - NEW YORK CITY DEPARTMENT OF INFORMATION AND TECHNOLOGY

75 0 75'

Title:

SURROUNDING LAND USE

408 WEST 207TH STREET
MANHATTAN, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: D.M.	Date: 01/17/22	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	4
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y138.4.mxd		

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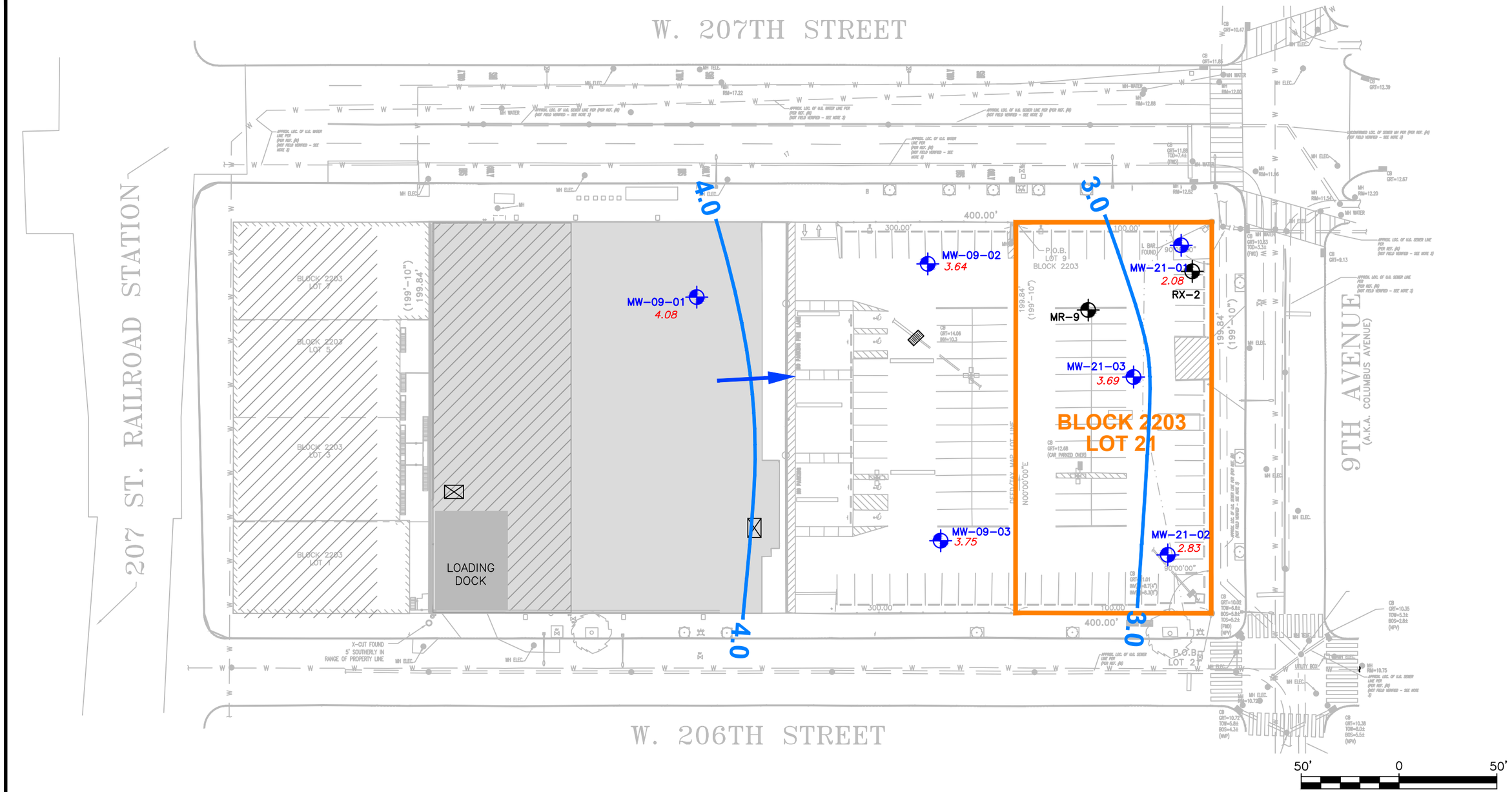

LEGEND

MW-21-02	SOIL BORING AND MONITORING WELL LOCATION AND DESIGNATION
3.69	INFERRED GROUNDWATER ELEVATION IN FEET (NAVD88)
3.0	INFERRED LINE OF EQUAL GROUNDWATER ELEVATION IN FEET (NAVD88)
→	INFERRED GROUNDWATER FLOW DIRECTION
	GROCERY STORE FOOTPRINT
	GROCERY STORE BASEMENT
	ELEVATOR
	CATCH BASIN
	SITE BOUNDARY

NOTE

OFFSITE MONITORING WELLS FROM ADJACENT BCP SITE C231144 ARE DEPICTED AND USED TO PROVIDE ADDITIONAL GROUNDWATER FLOW DATA.

REFERENCE:

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

RI SOIL BORING LOCATIONS SURVEYED BY MEGA ENGINEERING AND LAND SURVEYING, P.C., 11/05/2021 AND 11/19/2021

Title:

GROUNDWATER CONTOUR MAP NOVEMBER 19, 2021

408 W 207TH STREET
NEW YORK, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: V.S.	Date: 12JAN22	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	5
Project Mgr: V.S.	Project: 2477.0008Y003	
File: 2477.0008Y138.03.DWG		

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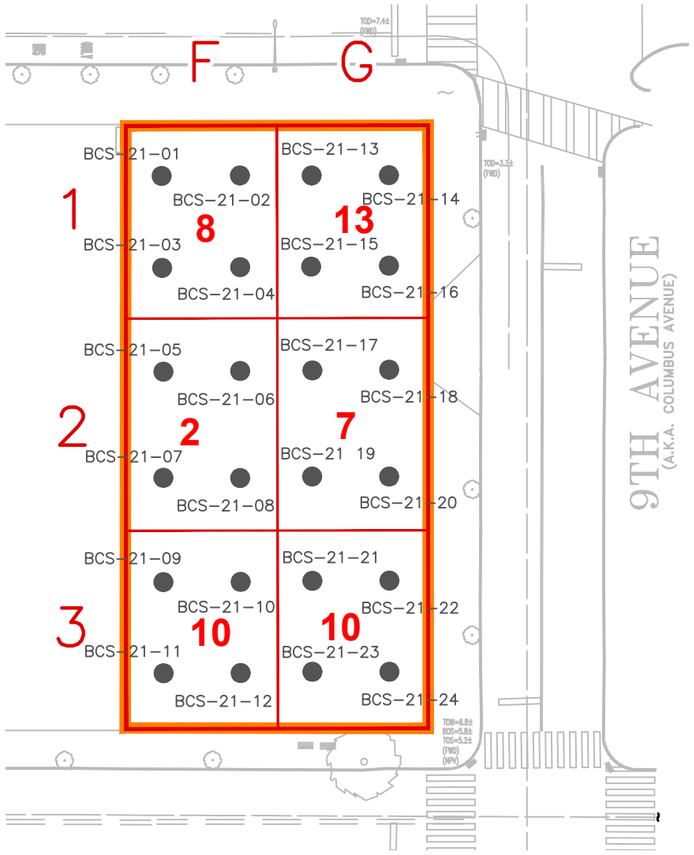


LEGEND

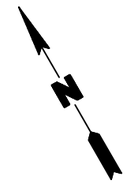
10	PROPOSED REMEDIAL EXCAVATION DEPTH TO MEET UUSCOS (FT BLS) (SEE NOTE 1)
BCS-09-01 ●	PROPOSED BOTTOM CONFIRMATION SAMPLE LOCATION AND DESIGNATION (SEE NOTE 2)
▬	WASTE CHARACTERIZATION GRID
▬	SITE BOUNDARY
NAVD88	NORTH AMERICAN VERTICAL DATUM 1988
RRSCO	RESTRICTED RESIDENTIAL SOIL CLEANUP OBJECTIVE
UUSCO	UNRESTRICTED USE SOIL CLEANUP OBJECTIVE
BCS	BOTTOM CONFIRMATION SAMPLE
FT BLS	FEET BELOW LAND SURFACE
RAWP	REMEDIAL ACTION WORK PLAN

NOTES

1. REMEDIAL EXCAVATION DEPTHS ARE SHOWN AND ARE BASED ON THE DEPTH INTERVAL OF THE DEEPEST REMEDIAL INVESTIGATION SAMPLE EXCEEDANCE OF UUSCOS WITHIN EACH GRID. IT SHOULD BE NOTED THAT THE ENTIRE SITE WILL BE EXCAVATED TO ELEVATION −1.5 FT NAVD88 FOR REDEVELOPMENT PURPOSES. THEREFORE, THERE WILL BE NO INTERNAL SIDEWALLS BETWEEN THE GRIDS SINCE NO SOIL WILL REMAIN.
2. PROPOSED BOTTOM CONFIRMATION SAMPLES ARE SHOWN. REFER TO SECTION 10.2.1 OF THE RAWP FOR A DESCRIPTION OF SAMPLING FREQUENCIES AND ANALYTES. LOCATIONS ARE APPROXIMATE AND WILL BE BIASED TOWARD IMPACTS OBSERVED, IF ANY.
3. IF UUSCOS ARE NOT MET ACROSS ALL OR PART OF THE SITE, THE REMEDY WILL REVERT TO TRACK 2 RESTRICTED RESIDENTIAL CLEANUP AND AN ENVIRONMENTAL EASEMENT AND SITE MANAGEMENT PLAN WILL BE PUT IN PLACE.
4. THE TOPOGRAPHY OF THE SITE IS SLOPED TO THE EAST. THEREFORE, THE EXCAVATION DEPTH REQUIRED TO REACH THE PROPOSED REMEDIAL OR REDEVELOPMENT ELEVATIONS IS SHALLOWER ON THE EAST SIDE OF THE SITE COMPARED TO THE WEST SIDE OF THE SITE.
5. BACKFILL, IF REQUIRED, WILL MEET UUSCOS. FILL MATERIALS WITH LESS THAN 10 PERCENT PASSING THE NUMBER 80 SIEVE (I.E., VIRGIN STONE, VIRGIN GRAVEL, ETC.) DO NOT REQUIRE SAMPLING.

REFERENCE:

CONTROL POINT SURVEY V−001.00 DATED 7/10/2018. ALL 2021 REMEDIAL INVESTIGATION SAMPLE LOCATIONS SURVEYED BY MEGA ENGINEERING AND LAND SURVEYING, P.C. IN NOVEMBER 2021.



50’ 0 50’

Title:

REMEDIAL ALTERNATIVE 1: TRACK 1 UNRESTRICTED USE CLEANUP

408 WEST 207TH STREET
NEW YORK, NEW YORK

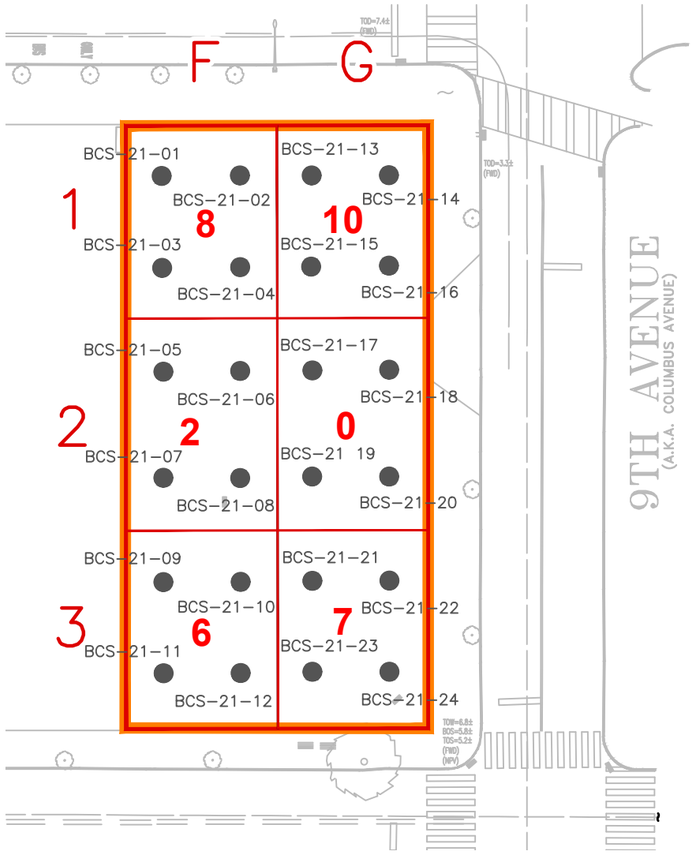
Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: N.C.	Date: 08MAR22	FIGURE
Prepared by: N.C.	Scale: AS SHOWN	6
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y138.07R.DWG		

S:\CLIENTS\TACONIC\2477.0008Y000 - INWOOD 410 WEST 207 ST\- RAWPS\LOT 21 - REF 1380 REVISED RAWP 2-2022\2477.0008Y138.07R.DWG



LEGEND

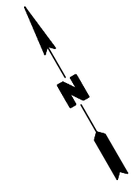
8	PROPOSED REMEDIAL EXCAVATION DEPTH TO MEET RRSCOS (FT BLS) (SEE NOTE 1)
BCS-09-01 ●	PROPOSED BOTTOM CONFIRMATION SAMPLE LOCATION AND DESIGNATION (SEE NOTE 2)
▬	WASTE CHARACTERIZATION GRID
▬	SITE BOUNDARY
NAVD88	NORTH AMERICAN VERTICAL DATUM 1988
RRSCO	RESTRICTED RESIDENTIAL SOIL CLEANUP OBJECTIVE
PGWSCO	PROTECTION OF GROUNDWATER SOIL CLEANUP OBJECTIVE
BCS	BOTTOM CONFIRMATION SAMPLE
FT BLS	FEET BELOW LAND SURFACE
RAWP	REMEDIAL ACTION WORK PLAN

NOTES

1. REMEDIAL EXCAVATION DEPTHS ARE SHOWN AND ARE BASED ON THE DEPTH INTERVAL OF THE DEEPEST REMEDIAL INVESTIGATION SAMPLE EXCEEDANCE OF RRSCOS WITHIN EACH GRID. IT SHOULD BE NOTED THAT THE ENTIRE SITE WILL BE EXCAVATED TO ELEVATION −1.5 FT NAVD88 FOR REDEVELOPMENT PURPOSES. THEREFORE, THERE WILL BE NO INTERNAL SIDEWALLS BETWEEN THE GRIDS SINCE NO SOIL WILL REMAIN.
2. PROPOSED BOTTOM CONFIRMATION SAMPLES ARE SHOWN. REFER TO SECTION 10.2.1 OF THE RAWP FOR A DESCRIPTION OF BOTTOM CONFIRMATION SAMPLING FREQUENCIES AND ANALYTES. LOCATIONS ARE APPROXIMATE AND WILL BE BIASED TOWARD IMPACTS OBSERVED, IF ANY.
3. NO REMEDIAL EXCAVATION IS REQUIRED IN THESE AREAS TO MEET RRSCOS, AS CONFIRMED BY EXISTING SAMPLES.
4. THE TOPOGRAPHY OF THE SITE IS SLOPED TO THE EAST. THEREFORE, THE EXCAVATION DEPTH REQUIRED TO REACH THE PROPOSED REMEDIAL OR REDEVELOPMENT ELEVATIONS IS SHALLOWER ON THE EAST SIDE OF THE SITE COMPARED TO THE WEST SIDE OF THE SITE.
5. BACKFILL WILL MEET THE LOWER OF RRSCOS OR PGWSCOS. FILL MATERIALS WITH LESS THAN 10 PERCENT PASSING THE NUMBER 80 SIEVE (I.E., VIRGIN STONE, VIRGIN GRAVEL, ETC.) DO NOT REQUIRE SAMPLING. .

REFERENCE:

CONTROL POINT SURVEY V−001.00 DATED 7/10/2018. ALL 2021 REMEDIAL INVESTIGATION SAMPLE LOCATIONS SURVEYED BY MEGA ENGINEERING AND LAND SURVEYING, P.C. IN NOVEMBER 2021.



50’ 0 50’

Title:

REMEDIAL ALTERNATIVE 2: TRACK 2 RESTRICTED RESIDENTIAL USE CLEANUP

408 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: N.C.	Date: 14JAN22	FIGURE
Prepared by: N.C.	Scale: AS SHOWN	7
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y138.08R.DWG		

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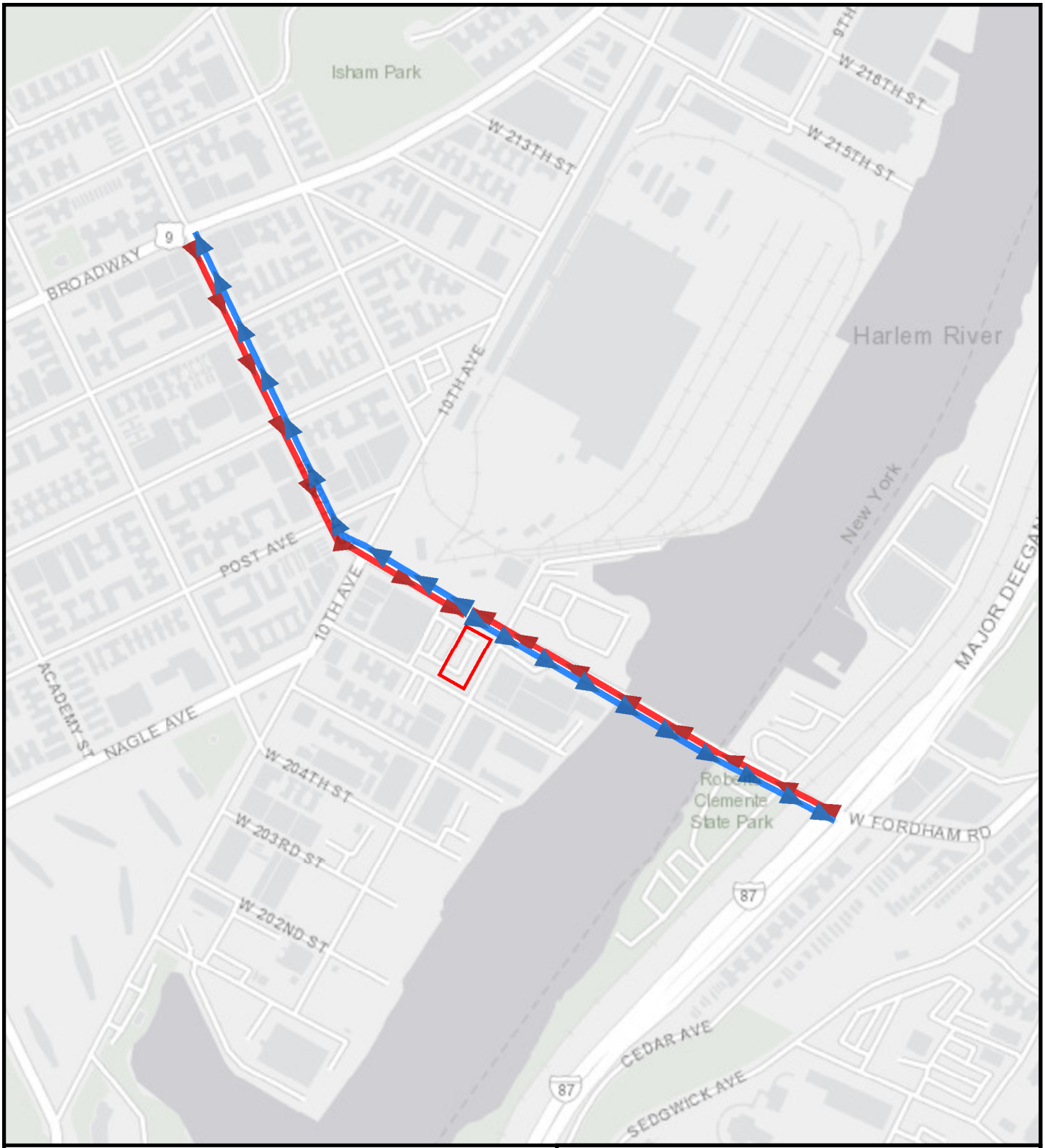

IN-BOUND ROUTE

OPTION 1: HEAD WEST VIA W 207TH STAND UNIVERSITY HEIGHTS BRIDGE TOWARD ROUTE 87/MAJOR DEEGAN

OPTION 2: HEAD SOUTHEAST W VIA 207TH ST TOWARD ROUTE 9/BROADWAY

OUT-BOUND ROUTE

OPTION 1: HEAD EAST VIA W 207TH STAND UNIVERSITY HEIGHTS BRIDGE TOWARD ROUTE 87/MAJOR DEEGAN

OPTION 2: HEAD NORTHWEST VIA W 207TH ST TOWARD ROUTE 9/BROADWAY

N

0 500'

Title:

TRUCK ROUTE MAP

BLOCK 2203 LOT 21
408 WEST 207TH STREET
NEW YORK. NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: V.S.	Date: 01/17/22
Prepared by: M.S.R.	Scale: AS SHOWN
Project Mgr: V.S.	Project: 2477.0008Y000
File: 2477.0008Y138.8.mxd	

FIGURE 8

V:\GIS\PROJECTS\2477Y0008Y\138\2477.0008Y138.8.MXD

APPENDICES

(Provided on USB Drive in Bound Copy)

A. Redevelopment Plans (not included in Final RAWP)
B. Soil Boring and Well Construction Logs
C. Citizens Participation Plan
D. Health and Safety Plan (and Community Air Monitoring Plan)
E. Quality Assurance Project Plan/ Field Sampling Plan
F. Resumes of Key Personnel
G. Request for Import/Reuse Fill Material Form

APPENDIX A

Redevelopment Plans
(not included in Final RAWP)

APPENDIX B

Soil Boring and Well Construction Logs

MR-11

Client: Taconic Investment Partners, LLC	Site: 410 W 207th St	Project Number: 2477.0008Y000
Address: 410 W 207th St	City/State: New York, NY	Logged By: L. Curnutte

Start to Finish Date: 7/23/2018 - 7/23/2018	Contractor: Warren George	Drill Type: Geoprobe	Sampler Type/Method: 3" Split Spoon
Borehole Depth: 13 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW:
Area: Lot 21/Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT.	G		1.2	
	MIXD	CONCRETE, BRICK, and medium SAND (FILL); moist.				Soil sample MR-11/0.25-0.75 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, herbicides, and cyanide. 12" recovery.
	MIXD	Brown to black, medium to fine SAND, GRAVEL, BRICK, TILE (FILL); moist.			4.0	Slight odor observed.
5	MIXD	Brown to black, medium to fine SAND, GRAVEL, BRICK, TILE (FILL); moist.			6.7	12" recovery.
	MIXD	Brown, medium to fine SAND, some Gravel, some Brick, some Tile (FILL); moist.			2.3	Soil sample MR-11/5-6.5 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, herbicides, and cyanide. 18" recovery.
	SW	Dark to light brown, medium to fine SAND and GRAVEL; moist.				
10	SP	Brown, medium SAND, some Gravel, trace silt; wet.			2.9	12" recovery.
	SPG	Brown to dark brown, medium to coarse SAND, some Gravel, trace silt, trace crushed stone, trace brick; wet.			1.7	
					2.2	End of boring 13' bls.

Bottom of borehole at 13 feet

ROUX STANDARD LOG_ - 1/12/22 20:50 - S:\GINT\PROJECTS\2477.0008Y000.GPJ

MR-9

Client: Taconic Investment Partners, LLC	Site: 410 W 207th St	Project Number: 2477.0008Y000
Address: 410 W 207th St	City/State: New York, NY	Logged By: L. Curnutte

Start to Finish Date: 7/26/2018 - 7/26/2018	Contractor: Warren George	Drill Type: Geoprobe	Sampler Type/Method: 3" Split Spoon
Borehole Depth: 10 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW:
Area: Lot 21/Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.				
	MIXD		ASPHALT, SUB-BASE and STONE.	G			Soil sample MR-9/1-1.5 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, herbicides, and cyanide.
	MIXD		Brown to black, medium SAND, some Crushed Stone, some Glass, some Brick, some Organics (FILL); dry.			8.0	
			Brown to dark brown, medium to fine SAND, some Crushed Stone, some Brick (FILL).				No recovery.
	MIXD						10" recovery.
						10.3	
			Dark brown, fine SAND, some Gravel, some White Stone (FILL).			4.3	18" recovery.
5	MIXD						
	MIXD		Black, SAND, some Brick, some Stone (FILL).			5.5	
	SWG		Brown to light brown, coarse to fine SAND, some Gravel.				12" recovery.
						1.0	8" recovery.
							Soil sample MR-9/8-9 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, herbicides, and cyanide.
	SWG		Brown to white, coarse to fine SAND, some Gravel, trace silt; moist.			12.3	Water sample MR-9 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, herbicides, and cyanide.
	SWG		Brown to white, coarse to fine SAND, some Gravel, some Silt; wet.			1.0	
							End of boring 10' bls.
			Bottom of borehole at 10 feet				

ROUX STANDARD LOG_ - 1/12/22 20:50 - S:\GINT\PROJECTS\2477.0008Y000.GPJ

RX-1

Client: Taconic Investment Partners, LLC	Site: 410 W 207th St	Project Number: 2477.0008Y000
Address: 410 W 207th St	City/State: New York, NY	Logged By: M. Smith

Start to Finish Date: 9/26/2018 - 9/26/2018	Contractor: Warren George	Drill Type: Direct Push	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 16 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: Lot 21/Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT.	G			25" recovery. Odor observed. Soil sample RX-1/0.5-2.5 collected for VOCs, SVOCs, and TAL metals.
	MIXD	Brown, medium to fine SAND and SILT, trace gravel, trace broken concrete (FILL); dry.			15000	
5	MIXD	Dark brown, fine SAND and SILT, some Broken Concrete (FILL); dry.			15000	35" recovery. Odor observed. Soil sample RX-1/5.0-7.0 collected for VOCs.
	MIXD	Dark brown, fine SAND and SILT, some broken concrete (FILL); moist.			671	48" recovery. Soil sample RX-1/8.0-10.0 collected for VOCs, SVOCs, and TAL metals. Odor observed.
10	MLS	Dark grey to black, fine SAND and SILT, trace gravel; wet.			15000	Odor observed.
	ML	Dark brown, SILT, trace fine sand; wet.			124	Slight odor observed.
	MLS	Dark brown, fine SAND and SILT; wet.			2306	48" recovery. Slight odor observed.
15	MLS	Light brown, fine SAND and SILT, some medium SAND; wet.			201.4	Soil sample RX-1/13.5-15.5 collected for VOCs and SVOCs.
	ML	Dark brown, SILT and PEAT; wet.				End of boring 16' bls.
		Bottom of borehole at 16 feet				

ROUX STANDARD LOG_ - 1/12/22 20:50 - S:\GINT\PROJECTS\2477.0008Y000.GPJ

RX-2

Client: Taconic Investment Partners, LLC	Site: 410 W 207th St	Project Number: 2477.0008Y000
Address: 410 W 207th St	City/State: New York, NY	Logged By: M. Smith

Start to Finish Date: 9/26/2018 - 9/26/2018	Contractor: Warren George	Drill Type: Direct Push	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 16 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: Lot 21/Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.	G			
	MIXD		Dark brown, fine SAND and SILT, some Gravel and Broken Concrete (FILL); dry.			3806	26" recovery. Soil sample RX-2/0.5-2.5 collected for VOCs, SVOCs, and TAL metals. Odor observed.
5	MIXD		Brown to dark brown, fine SAND and SILT, trace gravel (FILL); dry.			14445	42" recovery. Odor observed.
	MIXD		White, BROKEN CONCRETE (FILL); dry.				
	MIXD		White, BROKEN CONCRETE, trace gravel (FILL); dry.			0.0	40" recovery. Water sample RX-2 collected for VOCs, SVOCs, and TAL metals.
10	MLS		Brown, fine SAND and SILT, trace gravel; wet.			15000	Odor observed. Soil sample RX-2/10.0-12.0 collected for VOCs, SVOCs, and TAL metals.
	MLS		Brown, fine SAND and SILT, trace gravel; wet.			1902	48" recovery. Odor observed.
15	CL-ML		Dark brown, SILT and CLAY, some Peat; wet.			25.1	End of boring 16' bls.
			Bottom of borehole at 16 feet				

ROUX STANDARD LOG - 1/12/22 20:50 - S:\GINT\PROJECTS\2477.0008Y000.GPJ

RX-26

Client: Taconic Investment Partners, LLC	Site: 410 W 207th St	Project Number: 2477.0008Y000
Address: 410 W 207th St	City/State: New York, NY	Logged By: L. Lai

Start to Finish Date: 1/12/2021 - 1/12/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 15 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: Lot 21/Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.				
			Dark brown, fine to medium SAND, some fine to coarse Gravel, little Concrete and Brick (FILL); moist.	G	5	0.1 0.2	
	MIXD					0.4	Soil sample RX-26_3-5 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, and mercury.
5						0.4	Soil sample RX-26_5-7 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, and mercury.
			Light brown, medium to coarse SAND, some Gravel and fine SAND; moist.		5	0.3	
	SPG						
10			Light brown, medium to coarse SAND, some Gravel and fine SAND; wet.				
	SPG						
			Brown, fine SAND, wet.		5		
	SPG						
			Brown, ORGANIC MATERIAL; wet.				
	PT						
			Bottom of borehole at 15 feet				

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RX-27

Client: Taconic Investment Partners, LLC	Site: 410 W 207th St	Project Number: 2477.0008Y000
Address: 410 W 207th St	City/State: New York, NY	Logged By: L. Lai

Start to Finish Date: 1/12/2021 - 1/12/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 15 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: Lot 21/Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.				
			Grey, fine to medium SAND, some fine to medium Gravel, little Asphalt and Brick (FILL); moist.				Odor observed.
						48.7	
	MIXD			G	5	77.0	
						80.6	
						90.2	Soil sample RX-27_0-2 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, and mercury.
5						68.6	
			Brown, fine to medium SAND, some fine to medium Gravel, little Asphalt and Brick (FILL); moist.			2.8	Odor observed.
	MIXD					15.4	
					5	27.2	Soil sample RX-27_5-7 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, and mercury.
			Brown, fine SAND, some Gravel; moist.			30.8	
	SPG						
10			Grey, fine to coarse SAND, trace fine Gravel; wet.			19.1	
	SW						
					5		
			Brown, fine SAND, trace medium to coarse sand; wet.				Soil sample RX-27_12-14 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, and mercury.
	SP					5.7	
						3.8	
			Bottom of borehole at 15 feet				

ROUX STANDARD LOG_ - 1/12/22 20:50 - S:\GINT\PROJECTS\2477.0008Y000.GPJ

RX-28

Client: Taconic Investment Partners, LLC	Site: 410 W 207th St	Project Number: 2477.0008Y000
Address: 410 W 207th St	City/State: New York, NY	Logged By: L. Lai

Start to Finish Date: 1/12/2021 - 1/12/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 10 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: Lot 21/Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.				
			Dark brown, fine to coarse SAND, some coarse Gravel, Asphalt and Concrete (FILL), little fine to medium Gravel; moist.			0.1	Soil sample RX-28_0-2 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, and mercury.
	MIXD			G	5	0.1	
			Light brown, fine SAND, little fine Gravel, trace asphalt (FILL); moist.			0.1	
5	MIXD						Soil sample RX-28_5-7 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, and mercury.
			Light brown, fine to medium SAND, some Gravel; wet.		4		
	SWG						
			Bottom of borehole at 10 feet				

ROUX STANDARD LOG - 1/12/22 20:50 - S:\GINT\PROJECTS\2477.0008Y000.GPJ

RX-29

Client:	Site:	Project Number:
Taconic Investment Partners, LLC	410 W 207th St	2477.0008Y000
Address:	**City/State:**	**Logged By:**
410 W 207th St	New York, NY	L. Lai

Start to Finish Date:	Contractor:	Drill Type:	Sampler Type/Method:
1/12/2021 - 1/12/2021	AARCO	Geoprobe	2" Macro-Core
Borehole Depth:	**Backfill:**	**Borehole Diameter:**	**DTW:**
10 feet	Cuttings	2-inches	
Area:	**Elevation:**	**Northing:**	**Easting:**
Lot 21/Parking Lot	NM	NM	NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.				
			Brown, fine to medium SAND, some fine to coarse Gravel, little Asphalt and Brick (FILL); moist.				Soil sample RX-29_0-2 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, and mercury.
	MIXD			G	5		Odor observed.
5						0.7	
	MIXD		Brown, fine SAND, some medium to coarse Sand, little fine to medium Gravel; wet.		5		Soil sample RX-29_5-7 collected for VOCs, SVOCs, TAL metals, PCBs, pesticides, and mercury.
	SWG		Light brown, fine to coarse SAND, little Gravel; wet.				
			Bottom of borehole at 10 feet				

ROUX STANDARD LOG_ - 1/12/22 20:50 - S:\GINT\PROJECTS\2477.0008Y000.GPJ

RX-3

Client:	Site:	Project Number:
Taconic Investment Partners, LLC	410 W 207th St	2477.0008Y000
Address:	**City/State:**	**Logged By:**
410 W 207th St	New York, NY	M. Smith

Start to Finish Date:	Contractor:	Drill Type:	Sampler Type/Method:
9/27/2018 - 9/27/2018	Warren George	Direct Push	2" Macro-Core
Borehole Depth:	**Backfill:**	**Borehole Diameter:**	**DTW:**
16 feet	Cuttings	2-inches	
Area:	**Elevation:**	**Northing:**	**Easting:**
Lot 21/Parking Lot	NM	NM	NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.	G		0.3	
	MIXD		Brown, fine SAND and SILT, some Gravel (FILL); dry.				30" recovery. Soil sample RX-3/0.5-2.5 collected for VOCs, SVOCs, and TAL metals.
5	MIXD		Dark brown, fine SAND and SILT, some Gravel, some Broken Concrete (FILL); dry.			32.3	36" recovery.
	SP		Brown to dark brown, fine to medium SAND, trace gravel; moist.			258.5	33" recovery. Slight odor observed.
10	SP		Brown to dark brown, fine to medium SAND, trace gravel; wet.				Soil sample RX-3/8.0-10.0 collected for VOCs, SVOCs, and TAL metals.
	SP		Brown to light brown, fine to medium SAND, trace gravel; wet.			40.1	48" recovery. Slight odor observed.
15	CL-ML		Dark brown, SILT and CLAY, some Peat; wet.				End of boring 16' bls.
			Bottom of borehole at 16 feet				

ROUX STANDARD LOG_ - 1/12/22 20:50 - S:\GINT\PROJECTS\2477.0008Y000.GPJ

RX-5

Client: Taconic Investment Partners, LLC	Site: 410 W 207th St	Project Number: 2477.0008Y000
Address: 410 W 207th St	City/State: New York, NY	Logged By: M. Smith

Start to Finish Date: 9/27/2018 - 9/27/2018	Contractor: Warren George	Drill Type: Direct Push	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 7 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: Lot 21/Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.	G		0.2	30" recovery. Soil sample RX-6/0.5-2.5 collected for VOCs, SVOCs, and TAL metals.
	MIXD		Brown, fine SAND and SILT, some Gravel and Broken Concrete (FILL); dry.				
	MIXD		Dark brown to black, fine SAND and SILT, some Gravel and Broken Concrete (FILL); dry.			0.0	40" recovery.
5	SP		Brown to light brown, medium to fine SAND, trace gravel; dry.			0.0	Soil sample RX-5/5.0-7.0 collected for VOCs, SVOCs, and TAL metals.
			Bottom of borehole at 7 feet				Hit refusal, end of boring 7' bls.

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RX-8

Client: Taconic Investment Partners, LLC	Site: 410 W 207th St	Project Number: 2477.0008Y000
Address: 410 W 207th St	City/State: New York, NY	Logged By: M. Smith

Start to Finish Date: 9/27/2018 - 9/27/2018	Contractor: Warren George	Drill Type: Direct Push	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 10 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: Lot 21/Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.			0.9	
			Brown, fine SAND and SILT, some Gravel, some concrete (fill); dry.	G			30" recovery. Soil sample RX-8/0.5-2.5 collected for VOCs, SVOCs, and TAL metals.
	MIXD						
			Brown, fine SAND and SILT, some Gravel, some Crushed Concrete (fill); dry.			0.0	28" recovery.
5							
	MIXD						
			Light brown, medium to fine SAND, trace gravel; wet.			0.5	22" recovery. Soil sample RX-8/8.0-10.0 collected for VOCs, SVOCs, and TAL metals.
	SP						Hit refusal, end of boring 10' bls.

Bottom of borehole at 10 feet

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G2

Client: Harlem River Ninth Avenue Development LLC	Site: 408 W 207th St	Project Number: 2477.0008Y003
Address: 408 W 207th St	City/State: New York, NY	Logged By: L. Jenkins

Start to Finish Date: 11/9/2021 - 11/12/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 20 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW: 10.5 feet
Area: Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT.			0.7	Pre-cleared to 5 ft bls.
	MIXD	Dark brown, fine to coarse SAND, some Gravel, little Brick, trace concrete (FILL); moist.	G	5	0.6 0.3	Soil sample G2 (0-3) collected for Part 375/TCL.
	MIXD	Dark brown, fine to coarse SAND, some Gravel, trace concrete (FILL); moist.			0.5 0.4	
5	SW	Dark brown, fine to coarse SAND, some fine Gravel, trace silt; moist.			0.4	
	SW	Dark brown to white, fine to coarse SAND, some fine Gravel, trace rock; moist.		4	6.0	Soil sample G2 (3-9) collected for Part 375/TCL.
10	SP	Brown, fine SAND, little Silt, trace gravel; wet.			0	Soil sample G2 (9-15) collected for Part 375/TCL.
	ML	Dark brown, SILT, some Clay, trace organics (peat); wet.		4	0.3	
15	SP-SM	Brown, fine SAND, some Silt, trace gravel; wet.			0.2	
	SP-SM	Greyish brown, fine SAND, some Silt, trace clay; wet.		4.5	0.0	End of boring at 20 ft bls.

Bottom of borehole at 20 feet

ROUX STANDARD LOG - 1/10/22 15:51 - S:\GINT\PROJECTS\2477.0008Y003.GPJ

SB-21-01/MW-21-01/G1

Client: Harlem River Ninth Avenue Development LLC	Site: 408 W 207th St	Project Number: 2477.0008Y003
Address: 408 W 207th St	City/State: New York, NY	Logged By: L. Jenkins

Start to Finish Date: 11/10/2021 - 11/11/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 20 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW: 10 feet
Area: Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Well Depth: 17 feet	Well Dia./Materials: 2-inch PVC	Screen Interval: 7-17 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	Flush Mount J-Plug	ASPH		ASPHALT				Pre-cleared to 6 ft bls.
		MIXD		Dark brown, fine to coarse SAND, some Concrete, trace asphalt (FILL); moist.			37.6	Odor observed from 0 to 20 ft bls.
		MIXD		Dark brown, fine to coarse SAND, some Concrete, trace asphalt (FILL); moist.			58.9	Soil sample G1 (0-3) collected for Part 375/TCL.
	Bentonite	MIXD		Dark brown to dark grey, fine to coarse SAND, some Gravel, trace concrete (FILL); moist.	G	6	108.7	Soil sample SB-21-01 (2-4) collected for Part 375/TCL and PFAS.
							169.9	Soil sample SB-21-01 (4-6) collected for Part 375/TCL and PFAS.
5		SW-SM		Dark grey, fine to medium SAND, some Silt, trace gravel; moist.			132.3	
	2" PVC Riser						79.8	Installed soil vapor point SV-21-01 to 6.5 ft bls.
		SW-SM		Dark brown to grey, fine to medium SAND, some Silt; moist		2.5	194.6	Soil sample SB-21-01 (6-8) collected for Part 375/TCL and PFAS.
							721.7	
							1003.0	Soil sample G1 (3-9) collected for Part 375/TCL.
10		SW-SM		Dark brown to grey, fine to medium SAND, some Silt; wet.			837.6	Soil sample SB-21-01 (10-12) collected for Part 375/TCL and PFAS.
	#2 Morie Sand						965.8	
				Dark brown, fine to medium SAND, some Silt; wet.			13650.0	Soil sample G1 (9-15) collected for Part 375/TCL.
	2" PVC Screen	SW-SM				4.5	56.5	Soil sample SB-21-01 (13-15) collected for Part 375/TCL and PFAS.
							42.7	
15		ML		Dark brown, SILT, trace clay and organics; wet.			116.0	Soil sample SB-21-01 (15-17) collected for Part 375/TCL and PFAS.
				Brown, fine SAND, some Silt; wet.			48.2	
	Bottom Plug	SP-SM				4	11.5	
							12.2	
							17.9	
							11.5	End of Boring at 20 ft bls.

Bottom of borehole at 20 feet

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SB-21-02/MW-21-02/G3

Client: Harlem River Ninth Avenue Development LLC	Site: 408 W 207th St	Project Number: 2477.0008Y003
Address: 408 W 207th St	City/State: New York, NY	Logged By: L. Jenkins

Start to Finish Date: 11/9/2021 - 11/11/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 20 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW: 11 feet
Area: Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Well Depth: 18 feet	Well Dia./Materials: 2-inch PVC	Screen Interval: 8-18 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	Flush Mount J-Plug	ASPH		ASPHALT				Pre-cleared to 5 ft bls.
		MIXD		Dark brown, fine to coarse SAND, some Concrete, trace brick, gravel, and silt (FILL); moist.	G	5		Soil sample G3 (0-2.5) collected for Part 375/TCL.
5	Bentonite	MIXD		Dark brown, fine to coarse SAND, little Silt, trace concrete (FILL); moist.				Soil sample SB-21-02 (4-6) collected for Part 375/TCL and PFAS.
		SWG		Light brown to light grey, medium to coarse SAND, little Cobble; moist.		3.5	0.0	Soil sample SB-21-02 (6-8) collected for Part 375/TCL and PFAS.
	2" PVC Riser						0.0	
							0.0	Soil sample SB-21-02 (8-10) collected for Part 375/TCL and PFAS.
10		SWG		Light brown, medium to coarse SAND, little Rock; moist.			0.0	Soil sample G3 (2.5-8.5) collected for Part 375/TCL.
	#2 Morie Sand	SP-SM		Reddish brown, fine SAND, some Silt; wet.		5	0.0	
							6.2	
	2" PVC Screen						6.2	
		CL-ML		Grey, CLAY, some Silt, little Organics; wet.			0.3	Soil sample G3 (8.5-14.5) collected for Part 375/TCL.
15		SW-SM		Greyish brown, fine to medium SAND, some Silt, trace cobble; wet.		5	0.3	
							0.0	
	Bottom Plug						0.0	
							0.0	
							0.0	
							0.0	End of Boring at 20 ft bls.

Bottom of borehole at 20 feet

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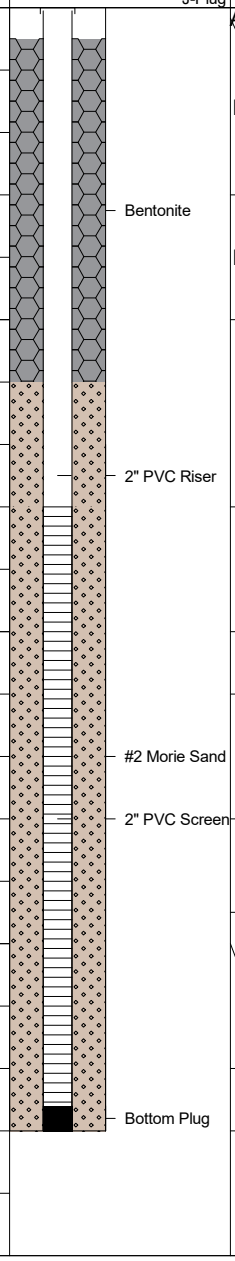
SB-21-03/MW-21-03

Client: Harlem River Ninth Avenue Development LLC	Site: 408 W 207th St	Project Number: 2477.0008Y003
Address: 408 W 207th St	City/State: New York, NY	Logged By: L. Jenkins

Start to Finish Date: 11/10/2021 - 11/11/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 20 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW: 11 feet
Area: Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Well Depth: 18 feet	Well Dia./Materials: 2-inch PVC	Screen Interval: 8-18 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite



Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT				Pre-cleared to 5 ft bls.
	MIXD	Dark brown, fine to coarse SAND, little Concrete, trace gravel and asphalt (FILL); moist.	G	5	0.7 3.0	Soil sample SB-21-03 (0-2) collected for Part 375/TCL and PFAS.
	MIXD	Greyish brown, fine to coarse SAND, little Gravel, trace concrete (FILL); moist.			2.7 2.5	Soil sample SB-21-03 (3-5) collected for Part 375/TCL and PFAS.
5	SP-SM	Dark brown to dark grey, fine SAND, some Silt; moist.		4	0.3 11 11 11	Soil sample SB-21-03 (5-7) collected for Part 375/TCL and PFAS. Soil sample SB-21-03 (7-9) collected for Part 375/TCL and PFAS.
	SW	Brown, medium to coarse SAND, trace silt and cobble; moist.			0.2	
10	SW	Dark brown, medium to coarse SAND, trace cobble; moist.		5	0.2	
	SW	Grey to light grey, medium to coarse SAND, trace cobble; wet.			0.0 0.0	
	MLS	Reddish brown, SILT, some fine to medium Sand; wet.			0.0 0.0	
	CL-ML	Dark brown, CLAY, some Silt, little Organics; wet.			0.0	
15	MLS	Reddish brown, SILT, some fine to medium Sand; wet.		5	0.0 0.0	
	CL-ML	Dark brown, CLAY, some Silt, little Organics; wet.			0.0	
	MLS	Grey, SILT, little fine Sand, trace organics; wet.			0.0 0.0 0.0	End of Boring at 20 ft bls.

Bottom of borehole at 20 feet

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SB-21-04/F3

Client: Harlem River Ninth Avenue Development LLC	Site: 408 W 207th St	Project Number: 2477.0008Y003
Address: 408 W 207th St	City/State: New York, NY	Logged By: L. Jenkins

Start to Finish Date: 11/9/2021 - 11/12/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 20 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW: 9.5 feet
Area: Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT				Pre-cleared to 5 ft bls.
	MIXD	Dark brown, fine to coarse SAND, some Asphalt, little Brick, trace silt (FILL); moist.			0.0	Soil sample SB-21-04 (0-2) collected for Part 375/TCL and PFAS.
		Dark brown, fine to coarse SAND, little Brick, trace gravel and silt (FILL); moist.	G	5	0.0	
	MIXD				0.0	Soil sample F3 (0-3.5) collected for Part 375/TCL.
					0.0	Soil sample SB-21-04 (4-6) collected for Part 375/TCL and PFAS.
5	MIXD	Dark brown, fine to coarse SAND, little Silt, trace brick (FILL); moist.			0.0	
					0.4	
	SW-SM	Brown, fine to medium SAND, little Silt; moist.			0.5	Installed soil vapor point SV-21-04 to 6.5 ft bls.
		Light brown to light grey, medium to coarse SAND, trace silt and rock; moist.		3		Soil sample SB-21-04 (6-8) collected for Part 375/TCL and PFAS.
	SW				0.3	Soil sample SB-21-04 (8-10) collected for Part 375/TCL and PFAS.
	SW-SM	Brown, fine to medium SAND, some Silt, trace gravel; wet.			0.0	Soil sample F3 (3.5-9.5) collected for Part 375/TCL.
10		Brown, SILT, some fine Sand; wet.				
	MLS				0.3	
				5		
		Dark brown, SILT, some Clay, trace organics; wet.				
	MH				0.0	
15		Brown, fine to coarse SAND, some Silt, little Gravel; wet.				Soil sample F3 (9.5-15.5) collected for Part 375/TCL.
	SW-SM				0.1	
		Dark brown, SILT, some Clay, trace organics; wet.		5		
	MH				0.0	
						End of Boring at 20 ft bls.

Bottom of borehole at 20 feet

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SB-21-05/F1

Client:	Site:	Project Number:
Harlem River Ninth Avenue Development LLC	408 W 207th St	2477.0008Y003
Address:	**City/State:**	**Logged By:**
408 W 207th St	New York, NY	L. Jenkins

Start to Finish Date:	Contractor:	Drill Type:	Sampler Type/Method:
11/9/2021 - 11/12/2021	AARCO	Geoprobe	2" Macro-Core
Borehole Depth:	**Backfill:**	**Borehole Diameter:**	**DTW:**
20 feet	Cuttings	2-inches	10 feet
Area:	**Elevation:**	**Northing:**	**Easting:**
Parking Lot	NM	NM	NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT				Pre-cleared to 6 ft bls.
	MIXD	Greyish brown, fine to coarse SAND, some Concrete, little Brick (FILL); moist.			1.8	
	MIXD	Dark brown, fine to coarse SAND, some Asphalt, little Concrete (FILL); moist.			0.1	Soil sample F1 (0-4.5) collected for Part 365/TCL.
	MIXD	Dark brown, fine to coarse SAND, some Gravel, trace silt and cobble (FILL); moist.	G	6	0.1	
5					0.1	Soil sample SB-21-05 (4-6) collected for Part 375/TCL and PFAS.
	SW-SM	Light brown to light grey, medium to coarse SAND, trace rock and silt; moist.			0.1	Soil sample SB-21-05 (6-8) collected for Part 375/TCL and PFAS.
	SW-SM			3.5	0.0	Installed soil vapor point SV-21-05 to 8 ft bls.
10		Light brown to light grey, medium to coarse SAND, trace rock and silt; wet.				Soil sample SB-21-05 (8-10) collected for Part 375/TCL and PFAS.
	SW-SM				0.0	Soil sample F1 (4.5-10.5) collected for Part 375/TCL.
	SW-SM	Brown, medium to coarse SAND, little Silt; wet.		4	0.1	
	SP-SM	Brown, fine SAND, some Silt; wet.			0.2	
15		Dark brown, SILT, little fine Sand; wet.				
	MLS				0.0	Soil sample F1 (10.5-16.5) collected for Part 375/TCL.
	MLS	Dark brown, SILT, some Clay, trace organics; wet.		4.5		
	MH				0.0	
						End of Boring at 20 ft bls.

Bottom of borehole at 20 feet

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SB-21-06

Client: Harlem River Ninth Avenue Development LLC	Site: 408 W 207th St	Project Number: 2477.0008Y003
Address: 408 W 207th St	City/State: New York, NY	Logged By: L. Jenkins

Start to Finish Date: 11/10/2021 - 11/12/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 20 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW: 10 feet
Area: Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT				Pre-cleared to 6 ft bls.
	MIXD	Dark Brown, fine to coarse SAND, little Concrete, trace brick and asphalt (FILL); moist.			0.1	
					0.1	Soil sample SB-21-06 (0-2) collected for Part 375/TCL and PFAS.
	MIXD	Dark brown, fine to coarse SAND, little Gravel, trace brick and concrete (FILL); moist.	G	6	0.0	Soil sample SB-21-06 (2-4) collected for Part 375/TCL and PFAS.
	MLS	Brown, SILT, little fine Sand; moist.			0.0	
5	MLS	Dark grey, SILT, some fine Sand; moist.			0.1	Soil sample SB-21-06 (4-6) collected for Part 375/TCL and PFAS.
	SW-SM	Light brown to light grey, fine to coarse SAND, some Silt, trace rock; moist.		2.5	1.7	Installed soil vapor point SV-21-06 to 6.5 ft bls.
					0.0	Soil sample SB-21-06 (6-8) collected for Part 375/TCL and PFAS.
10	SP-SM	Reddish brown, fine SAND, some Silt; wet.			0.0	
	MH	Dark brown, SILT, some Clay, trace organics; wet.		4	0.0	
15	MLS	Grey, SILT, some fine Sand, trace gravel; wet.		4.5	0.0	
					0.0	End of Boring at 20 ft bls.
		Bottom of borehole at 20 feet				

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SB-21-07/F2

Client:	Site:	Project Number:
Harlem River Ninth Avenue Development LLC	408 W 207th St	2477.0008Y003
Address:	**City/State:**	**Logged By:**
408 W 207th St	New York, NY	L. Jenkins

Start to Finish Date:	Contractor:	Drill Type:	Sampler Type/Method:
11/9/2021 - 11/12/2021	AARCO	Geoprobe	2" Macro-Core
Borehole Depth:	**Backfill:**	**Borehole Diameter:**	**DTW:**
20 feet	Cuttings	2-inches	10 feet
Area:	**Elevation:**	**Northing:**	**Easting:**
Parking Lot	NM	NM	NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT				Pre-cleared to 5 ft bls.
	MIXD		Dark brown, fine to coarse SAND, some Asphalt, little Gravel, trace brick (FILL); moist.			0.0	
			Dark brown, fine to coarse SAND, some Gravel, trace asphalt (FILL); moist.	G	5	0.0	Soil sample SB-21-07 (0-2) collected for Part 375/TCL and PFAS.
	MIXD					0.0	Soil sample SB-21-07 (2-4) collected for Part 375/TCL and PFAS.
	SW-SM		Brown, fine to medium SAND, some Silt, trace gravel; moist.			0.0	Soil sample F2 (0-4) collected for Part 375/TCL.
5	SW-SM		Brown, fine to coarse SAND, little Silt, trace cobble; moist.			0.0	Soil sample SB-21-07 (4-6) collected for Part 375/TCL and PFAS.
			Light brown to light grey, fine to coarse SAND, trace silt and cobble; moist.			0.3	
	SW				3.5	0.0	Soil sample SB-21-07 (6-8) collected for Part 375/TCL and PFAS.
							Soil sample F2 (4-10) collected for Part 375/TCL.
10	SW		Light brown to light grey, fine to coarse SAND, trace silt and cobble; wet.			0.0	
			Brown, fine to coarse SAND, little Silt, trace cobble; wet.				Soil sample F2 (10-16) collected for Part 375/TCL.
	SW-SM				3.5	0.1	
15						0.3	
	SP-SM		Brown, fine SAND, some Silt; wet.			0.1	
			Dark brown, SILT, some Clay, trace organics; wet.		5		
	MH					0.0	
							End of boring at 20 ft bls.

Bottom of borehole at 20 feet

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SB-21-08

Client: Harlem River Ninth Avenue Development LLC	Site: 408 W 207th St	Project Number: 2477.0008Y003
Address: 408 W 207th St	City/State: New York, NY	Logged By: L. Jenkins

Start to Finish Date: 11/10/2021 - 11/12/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 20 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW: 10 feet
Area: Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT				Pre-cleared to 5 ft bls.
	MIXD	Dark brown, fine to coarse SAND, little Asphalt, trace concrete and silt (FILL); moist.			0.3	Soil sample SB-21-08 (0-2) collected for Part 375/TCL and PFAS.
		Dark brown, fine to coarse SAND, trace concrete and gravel (FILL); moist	G	5	0.2	
	MIXD					Soil sample SB-21-08 (3-5) collected for Part 375/TCL and PFAS.
5		Light brown to light grey, fine to coarse SAND, some Silt, trace gravel; moist.				Soil sample SB-21-08 (5-7) collected for Part 375/TCL and PFAS.
	SW-SM			3	0.1	Soil sample SB-21-08 (7-9) collected for Part 375/TCL and PFAS.
10		Brown, fine SAND, some Silt, trace gravel; wet.			0.0	
	SP-SM			3.5		
		Dark brown, SILT, some Clay, trace organics; wet.			0.0	
	ML					
15		Brown, SILT, some fine Sand, trace gravel; wet.			0.3	
	MLS			4.5		
		Grey, SILT, some Clay; wet.			0.0	
	MH					End of Boring at 20 ft bls.
		Bottom of borehole at 20 feet				

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SB-21-09

Client: Harlem River Ninth Avenue Development LLC	Site: 408 W 207th St	Project Number: 2477.0008Y003
Address: 408 W 207th St	City/State: New York, NY	Logged By: L. Jenkins

Start to Finish Date: 11/9/2021 - 11/12/2021	Contractor: AARCO	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 20 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW: 10.5 feet
Area: Parking Lot	Elevation: NM	Northing: NM	Easting: NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT				Pre-cleared to 5 ft bls.
	MIXD	Dark brown, fine to coarse SAND, some Concrete, little Asphalt, trace brick and gravel (FILL); moist.			0.0	
		Dark brown, fine to coarse SAND, little Concrete, trace brick and gravel (FILL); moist	G	5	0.0	Soil sample SB-21-09 (0-2) collected for Part 375/TCL and PFAS.
	MIXD				0.0	
					0.0	Soil sample SB-21-09 (4-6) collected for Part 375/TCL and PFAS.
5	MIXD	Brown, fine to coarse SAND, little Silt, trace brick and gravel (FILL); moist.			0.0	
		Light brown to light grey, fine to coarse SAND, some Silt, trace rock; moist.			0.0	Soil sample SB-21-09 (6-8) collected for Part 375/TCL and PFAS.
	SW-SM			3		
					0.0	Soil sample SB-21-09 (8-10) collected for Part 375/TCL and PFAS.
10	SP-SM	Brown, fine SAND, some Silt, trace cobble; moist.			0.0	
		Brown, fine SAND, some Silt; wet.				
	SP-SM			5	0.0	
15		Dark brown, SILT, some Clay, trace organics; wet.				
	MH			2	0.0	End of Boring at 20 ft bls.

Bottom of borehole at 20 feet

ROUX STANDARD LOG - 1/10/22 15:51 - S:\GINT\PROJECTS\2477.0008Y003.GPJ

APPENDIX C

Citizens Participation Plan

NEW YORK
STATE OF
OPPORTUNITY.

Department of
Environmental
Conservation

Brownfield Cleanup Program

Citizen Participation Plan
for
408 West 207th Street

September 2021

C231147
408 West 207th Street
New York, NY 10034

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Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **Harlem River Ninth Avenue Development LLC ("Applicant")**
Site Name: **408 West 207th Street ("Site")**
Site Address: **408 West 207th Street**
Site County: **New York County**
Site Number: **C231147**

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) the oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at:
http://www.dec.ny.gov/chemical/8450.html.

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why it is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision-makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment.
- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process.

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process.
- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community.
- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision-making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web-site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The site contact list includes, at a minimum:

- Chief executive officer and planning board chairperson of each county, city, town, and village in which the site is located;
- Residents, owners, and occupants of the site and properties adjacent to the site;
- The public water supplier which services the area in which the site is located;
- Any person who has requested to be placed on the site contact list;

- The administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility; and
- Location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site. See http://www.dec.ny.gov/chemical/61092.html .

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in Appendix A if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The flowchart in Appendix D shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.
- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

Local document repositories have also been established at the following locations:

Inwood Library
4857 Broadway
New York, New York 10034
Phone: 212-942-2445
Manager: Danita Nichols

Manhattan Community Board 12
Chairman: Eleazar Bueno
District Manager: Ebenezer Smith
Environmental Committee Chairman: Steve Simon
530 West 166th Street, 6th Floor
New York, New York 10032
Phone: (212) 568-8500
Fax: (212) 740-8197
Email: dblow@cb.nyc.gov

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/ implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being, or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, the significant threat determination for the site had not yet been made.

To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at
http://www.dec.ny.gov/regulations/2590.html

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page.

Citizen Participation Activities	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repository(ies)	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation **Note:** Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Interim Remedial Measure (IRM)/ Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet. The RI Work Plan / Interim Remedial Measures Plan was submitted with BCP Application and was included as part of the BCP public comment period.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC)	At the time the cleanup action has been completed. **Note:** The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the site. Additional major issues of public concern may be identified during the course of the site's investigation and cleanup process.

The Applicant is committed to informing and involving the public during the investigation and remediation of the project. The objective of the CP Plan is to promote communication and to assist the public in understanding the project process. Citizen participation in the project process provides the Applicant and the NYSDEC with an opportunity to obtain public input as part of the comprehensive redevelopment process.

No major issues of public concern have been identified relative to the site as of yet. The site may be busy during daytime working hours due to construction-related noise and vehicular traffic associated with the potential investigation and remediation activities throughout the cleanup process.

The site is located in an Environmental Justice Area. Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities. This CP Plan serves as a guide to better enable communication between the community and the proposed BCP project.

Because the site is located in an area with a large Hispanic-American population nearby, all future fact sheets will be translated into Spanish.

For additional information, visit:
https://popfactfinder.planning.nyc.gov/profile/1006/demographic.

The program will include procedures for protection of public health and safety during investigation and remediation activities. During investigation and remediation, worker and community health and safety activities will be conducted, including:

- Securing the work perimeter with a NYC Department of Buildings-approved fence during remediation/construction;
- On-site air monitoring for worker protection, if warranted;
- Perimeter air monitoring for community protection, if warranted; and
- Using odor, vapor, and dust controls such as water or foam sprays, as required during air monitoring, if needed.

Details on the Site Health and Safety Plan (HASP) and the Community Air Monitoring Plan (CAMP) will be included in the documents generated in support of the remediation.

4. Site Information

Appendix C contains a map identifying the location of the site.

Site Description

The Site is located at 408 West 207th Street in the Inwood section of Manhattan. The Site is located at Tax Block 2203 and Lot 21 in New York County and encompasses approximately 0.46-acres. The Site is currently comprised of an asphalt-paved parking lot as shown in Appendix C.

History of Site Use, Investigation, and Cleanup

Records indicate that the Site has had commercial uses, developed as early as 1926. Commercial uses have included an automobile garage and a gasoline filling station. By 1969, all structures had been removed and a paved parking lot that remains today had been completed.

A Phase I Environmental Site Assessment (ESA) performed in October 2010 identified the potential presence of urban fill material as well as the former automobile and gasoline filling operations as recognized environmental conditions (RECs) for the Site. A Phase II ESA was then completed in December 2011, which included the collection of soil and groundwater samples. Soil borings drilled and samples collected during this investigation showed the presence of historic urban fill soils (identified by the inclusion of concrete, bricks, and other non-native elements) across the Site with volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals usually associated with such fill material. Evidence of staining and odors consistent with petroleum contamination was observed in soil borings in the northern portion of the Site. Groundwater samples detected several VOCs and one SVOC above the regulatory standards (NYSDEC Ambient Water Quality Standards and Guidance Values [AWQSGVs]).

Roux Environmental Engineering and Geology, D.P.C. (Roux) completed a Remedial Investigation in June 2019, which included the collection of soil, groundwater, and soil vapor samples. Soil analytical results indicated the presence of VOCs and metals with some concentrations exceeding regulatory standards (Unrestricted Use Soil Cleanup Objectives [UUSCOs] and Restricted Residential Soil Cleanup Objectives [RRSCOs]). Groundwater analytical results indicated the presence of VOCs, SVOCs, and metals exceeding the Ambient Water Quality Standards and Guidance Values (AWQSGVs). Soil vapor samples collected showed elevated levels of petroleum-related VOCs and low levels of chlorinated VOCs.

Additionally, supplemental soil sampling was performed by Roux in January and February 2021 during the pre-application process for entry into the BCP. Soil analytical results indicate the presence of SVOCs (particularly a subset called polycyclic aromatic hydrocarbons [PAHs]) and metals with some concentrations exceeding UUSCOs and RRSCOs. The soil sampling program also indicated the presence of historic fill containing construction demolition debris (e.g., brick, concrete).

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination onsite, and must conduct a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish, and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant proposes that the site will have unrestricted use.

To achieve this goal, the Applicant will conduct investigation and cleanup activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

Investigation

The Applicant will conduct an investigation of the site officially called a "remedial investigation" (RI). This investigation will be performed with NYSDEC oversight. The Applicant must develop a remedial investigation workplan, which is subject to public comment.

The site investigation has several goals:

1) Define the nature and extent of contamination in soil, surface water, groundwater and any other parts of the environment that may be affected;
2) Identify the source(s) of the contamination;
3) Assess the impact of the contamination on public health and the environment; and
4) Provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The Applicant has submitted a draft "Interim Remedial Measure/Remedial Investigation Work Plan" to NYSDEC that is currently under review and approval. NYSDEC has already made the draft plan available to the public for review during a 30-day public comment period concurrent with the Application.

When the investigation is complete, the Applicant will prepare and submit a report that summarizes the results. This report also will recommend whether cleanup action is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site poses a significant threat to public health or the environment. If the site is a "significant threat," it must be cleaned up using a remedy selected by NYSDEC from an analysis of

alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. The IRM/RIWP was submitted with BCP Application and was included as part of the BCP public comment period.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a "Remedial Work Plan". The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a Final Engineering Report (FER) that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the FER. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An *engineering control* is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A -
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Kyle Forster
Project Manager
NYSDEC Region 2
Division of Environmental Remediation
625 Broadway
Albany, New York 12233
Tel: (518) 402-8644
kyle.forster@dec.ny.gov

Environmental Justice Program Hotline
(866) 229-0497

New York State Department of Health (NYSDOH):

Renata Ockerby
Project Manager
NYSDOH Bureau of Environmental Exposure Investigation
Corning Tower Room 1787
Albany, New York 12237
BEEI@health.ny.gov
Tel: (518) 402-0445

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Inwood Library
4857 Broadway
New York, New York 10034
Phone: 212-942-2445

Hours: Monday: 10AM-7PM
Tuesday: 10AM-7PM
Wednesday: 10AM-7PM
Thursday: 10AM-7PM
Friday: 10AM-5PM
Saturday: 10AM-5PM
Sunday: Closed

Manhattan Community Board District 12
530 West 166th Street
New York, New York 10032
Phone: (212) 568-8500
Fax: (212) 740-8197

Appendix B - Site Contact List

i. Local and State Officials

Councilman Ydanis Rodriguez
10th Council District
618 West 177th Street, Ground Floor
New York, NY 10033
Tel: 917-521-2616
Fax: 917-521-1293

Senator Robert Jackson
31st Senatorial District
5030 Broadway, Suite 701
New York, NY 10034
Tel: 212-544-0173
Fax: 212-544-0256

Assemblywoman Carmen N. De La Rosa
72nd Assembly District
210 Sherman Ave, Ste A&C
New York, NY 10034
Tel: 212-544-2278

Hon. Kirsten E. Gillibrand
U.S. Senator
780 Third Avenue, Suite 2601
New York, NY 10017
Tel: 212-688-6262
Fax: 866-824-6340

Congressman Adriano Espaillat
13th Congressional District
720 West 181st St, Suite 2
New York, NY 10033
Tel: 212-497-5959

Manhattan Borough President
Gale Brewer
431 West 125th Street
New York NY 10027
Tel: 212-531-1609
Fax: 212-669-4305

Hon. Mayor Bill de Blasio
New York City Hall
New York, NY 10007
Phone: 212-718-7585
Fax: 212-406-3587

NYC Comptroller Scott Stringer
1 Centre Street
New York, NY 10007
212-669-3916

Public Advocate Jumaane D. Williams
Community Affairs
1 Centre Street, 15th Floor
New York, NY 10007
212-669-7200
Fax: 212-669-4701

Hon. Charles E. Schumer
U.S. Senator
780 Third Avenue, Suite 2301
New York, NY 10017-2110
212-486-4430
Fax: 212-486-7693

Hon. Milton Tingling
Count Clerk of New York County
New York County Courthouse
60 Centre Street, Room 161
New York, NY 10007
Tel: 646-386-5955

ii. Current Site Owner/Operator

Current Site Owner
Harlem River Ninth Avenue Development LLC
c/o L+M Development Partners
1865 Palmer Avenue
Larchmont, NY 10538

iii. Current Owners and Occupants of the Subject Site and Adjacent Sites

Subject Site Owner:
Block 2203, Lot 21
Harlem River Ninth Avenue
Development LLC
1865 Palmer Avenue
Larchmont NY 10538 (Requestor)

Adjacent Properties to the North:
Block 2189, Lot 1R
NYC TRANSIT
10 Avenue
New York, NY 10034

Block 2189, Lot 60
HESS RETAIL STORES LLC
401 West 207th St
New York, NY 10034

Adjacent Properties to the South
Block 2202, Lot 9R
420 WEST 206 STREET OWNERS CORP
416 West 206th St
New York, NY 10034

Block 2202, Lot 17
3815 9TH AVE INC
414 West 206th St
New York, NY 10034

Block 2202, Lot 21
3842 9th AVE REALTY, INC.
3842 9th Avenue
New York, NY 10034

Adjacent Properties to the West
Block 2203, Lot 9
WEST 207 GROCERY OWNERS, LLC
421 Seventh Ave, 15th Floor
New York, NY 10001
(Owner)

Inwood Lot 9 Associates LLC
c/o Taconic Investment Partners
111 Eighth Avenue, Suite 1500
New York, NY 10011
(Ground Lessee)

Adjacent Properties to the East
Block 2187, Lot 1, 5, and 7
FLAIR BEVERAGE CORP.
3849 9th Avenue
New York, NY 10034

iv. Religious Authorities/Police and Fire Departments/Civic and Environmental Organizations

New York City Police Department 34th Precinct Council
Stephen Feldheim - President
4295 Broadway
New York, NY 10033

FDNY Engine 95/Ladder 36
29 Vermilyea Ave
New York, NY 10034

Fundacio Cristianos Por la Democracia
572 West 187th St
New York, NY 10033

Church of The Good Shepherd
4967 Broadway
New York, NY 10034

Our Lady Queen of Martyrs Roman Catholic Church
91 Arden Street
New York, NY 10040

Rocky Mt Baptist Church
37 Hillside Avenue
New York, 10040

Rain Inwood Neighborhood
Senior Center
84 Vermilyea Avenue
New York, NY 10034

Holy Trinity Episcopal Church
20 Cumming St
New York, NY 10034

Mt Washington Presbyterian Church

84 Vermilyea Avenue
New York, NY 10034

Dyckman Spanish Seventh-Day Adventist Church
111-113 Vermilyea Avenue
New York, NY 10034

Everyday Christian Church
4862 Broadway
New York, NY 10034

Christ Crucified Fellowship Church
433 West 204th Street
New York, NY 10034

Manhattan Bible Church
401 West 205th St
New York, NY 10034

RAIN INWOOD NEIGHBORHOOD SENIOR CENTER
84 VERMILYEA AVENUE
New York, NY 10034

v. Day Cares and Schools

New York City Housing Authority's
Dyckman Day Care Center
3732 10th Avenue
New York, NY 10034

Little Red Daycare
176 Nagle Ave
New York, NY 10034

Galex Family Daycare
449 W 206th St
New York, NY 10034

EKG Family WeeCarer
584 Academy St #5
New York, NY 10034

The Playpen Daycare
107 Post Ave #2b
New York, NY 10034

My Little Dream Daycare
71 Vermilyea Ave
New York, NY 10034

Treehouse Daycare
11 Seaman Ave
New York, NY 10034

Aura's Bright Children Daycare
13-19 Cumming St
New York, NY 10034

Little Tots Daycare
514 W 211th St
New York, NY 10034

Step By Step Group Family Day Care
4966 Broadway
New York, NY 10034

Nicholas Cardell Day Care Center
84 Vermilyea Avenue
New York, NY 10034

Smart Start Learning Center WeeCare
125 Seaman Ave #2h
New York, NY 10034

Happy Shiny Faces Daycare
136 Seaman Ave
New York, NY 10034

Inwood Academy for Leadership Charter School
433 W 204th St
New York, NY 10034

Our Lady Queen of Martyrs School
71 Arden St
New York, NY 10040

The Equity Project Charter School
153 Sherman Ave
New York, NY 10034

Inwood Academy for Leadership
3898 10th Ave
New York, NY 10034

Washington Heights Academy
202 Sherman Ave
New York, NY 10034

High School for Excellence and Innovation
650 Academy St
New York, NY 10034

Muscota New School
4862 Broadway
New York, NY 10034

vi. Local Water Supply

Vincent Sapienza, Commissioner
New York City Department of Environmental Protection
59-17 Junction Boulevard
Flushing, NY 11373

vii. Local News and Media

Manhattan Times
5030 Broadway, Suite 807
New York, NY 10034

New York Post
1211 Avenue of the Americas
New York, NY 10036
(212) 930-8000

New York Daily News
4 New York Plaza
New York, NY 10004

Hoy Nueva York
15 Metrotech Center Floor 7
Brooklyn, NY 11201

El Diario La Prensa
15 Metrotech Center Floor 7
Brooklyn, NY 11201

The Harlem Community News
P.O.Box #1775
New York, NY 10027

NY1 News
75 Ninth Avenue
New York, NY 10011
(212) 367-0600

Latino Intelecto Newspapers
4 Payson Ave
New York, NY 10034

viii. Any Person, Community Based Organization, BOA Group, or Local Media Who Has Requested to be placed on the contact list

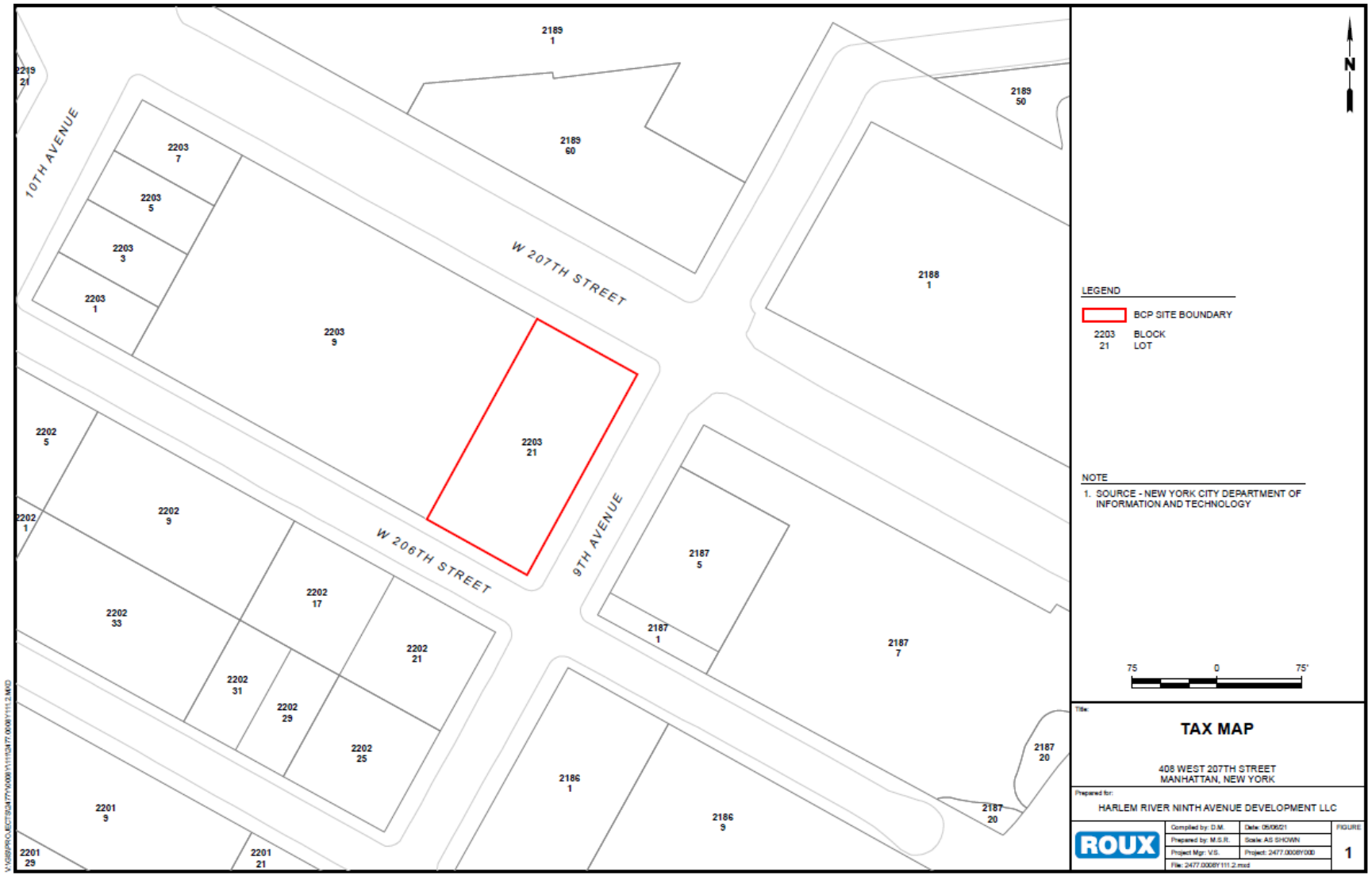
No persons have requested to be on the Site Contact List.

ix. Document Repository

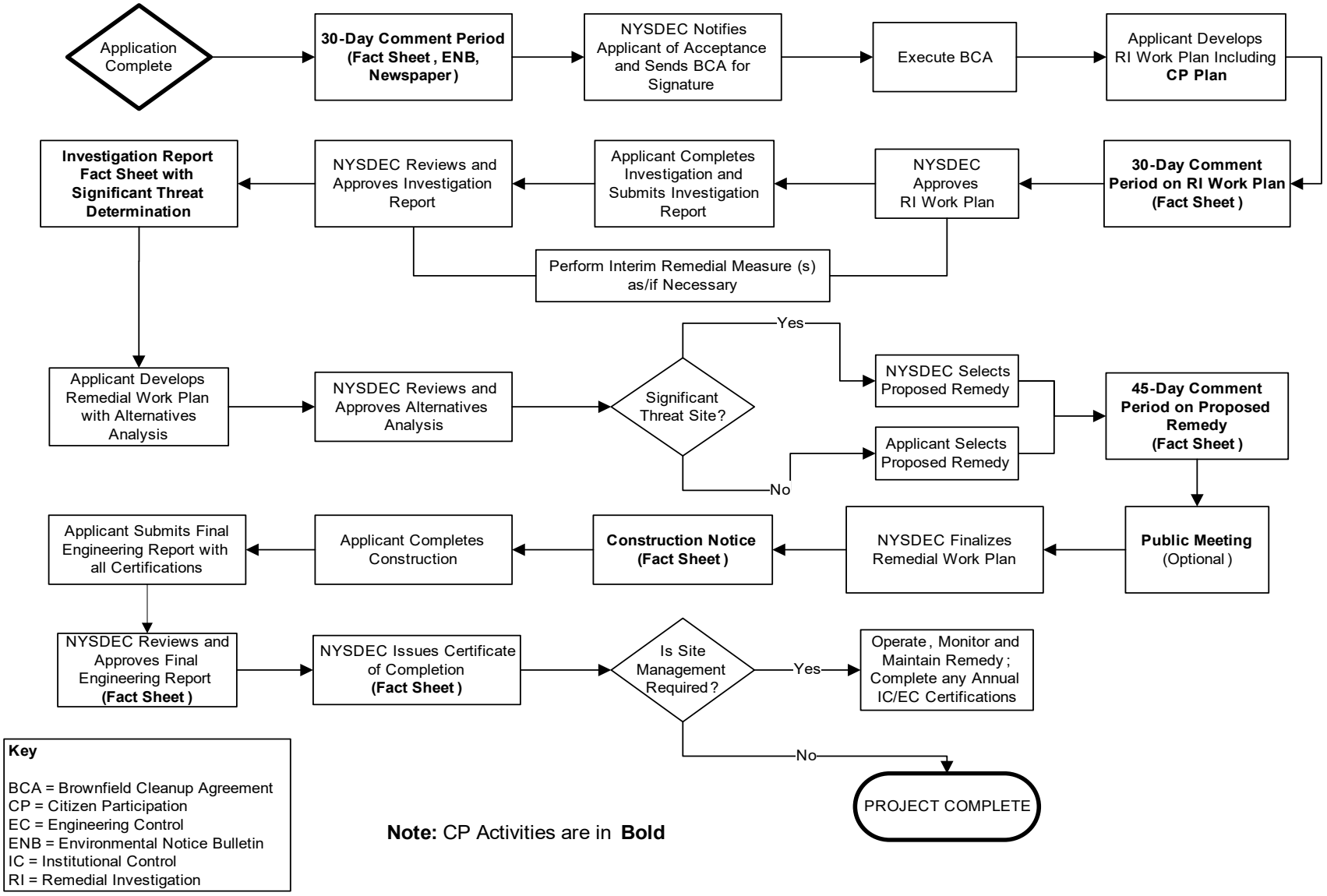
Inwood Library
4857 Broadway
New York, NY 10034
Phone: 212-942-2445

Manhattan Community Board District 12
530 West 166th Street
New York, NY 10032
Phone: (212) 568-8500
Fax: (212) 740-8197

Appendix C – Site Location Map



Appendix D– Brownfield Cleanup Program Process



Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern (see instructions)

Site Name: 408 West 207th St

Site Number: C231147

Site Address and County: 408 West 207th Street, Inwood, NY, New York County

Remedial Party(ies): Harlem River Ninth Avenue Development LLC

Note: For Parts 1. – 3. the individuals, groups, organizations, businesses and units of government identified should be added to the site contact list as appropriate.

Part 1. List major issues of public concern and information the community wants. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and information needs. **Use this information as an aid to prepare or update the Major Issues of Public Concern section of the site Citizen Participation Plan.**

No known issues.

How were these issues and/or information needs identified?

NA

Part 2. List important information needed **from** the community, if applicable. Identify individuals, groups, organizations, businesses and/or units of government related to the information needed.

None identified

How were these information needs identified?

NA

Part 3. List major issues and information that need to be communicated **to** the community. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and/or information.

None identified

How were these issues and/or information needs identified?

NA

Part 4. Identify the following characteristics of the affected/interested community. This knowledge will help to identify and understand issues and information important to the community, and ways to effectively develop and implement the site citizen participation plan (mark all that apply):

a. Land use/zoning at and around site:

☒ **Residential** ☐ **Agricultural** ☐ **Recreational** ☒ **Commercial** ☐ **Industrial**

b. Residential type around site:

☒ **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:

☒ **High** ☐ **Medium** ☐ **Low**

d. Water supply of nearby residences:

☒ **Public** ☐ **Private Wells** ☐ **Mixed**

e. Is part or all of the water supply of the affected/interested community currently impacted by the site?

☐ **Yes** ☒ **No**

Provide details if appropriate:

NA

f. Other environmental issues significantly impacted/impacting the affected community?

☐ **Yes** ☒ **No**

Provide details if appropriate:

NA

g. Is the site and/or the affected/interested community wholly or partly in an Environmental Justice Area?

☐ **Yes** ☒ **No**

h. Special considerations:

☒ **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**

Explain any marked categories in **h:**
Future fact sheets will be translated into Spanish.

Part 5. The site contact list must include, at a minimum, the individuals, groups, and organizations identified in Part 2. of the Citizen Participation Plan under 'Site Contact List'. Are *other* individuals, groups, organizations, and units of government affected by, or interested in, the site, or its remedial program? (Mark and identify all that apply, then adjust the site contact list as appropriate.)

☒ **Non-Adjacent Residents/Property Owners:** Click here to enter text.

☒ **Local Officials:** Click here to enter text.

☒ **Media:** Click here to enter text.

☐ **Business/Commercial Interests:** Click here to enter text.

☐ **Labor Group(s)/Employees:** Click here to enter text.

☐ **Indian Nation:** Click here to enter text.

☒ **Citizens/Community Group(s):** Click here to enter text.

☐ **Environmental Justice Group(s):** Click here to enter text.

☐ **Environmental Group(s):** Click here to enter text.

☒ **Civic Group(s):** Click here to enter text.

☐ **Recreational Group(s):** Click here to enter text.

☐ **Other(s):** Click here to enter text.

Prepared/Updated By: Jessica Taylor, Roux **Date:** 9/2/21

Reviewed/Approved By: Thomas V. Panzone **Date:** 9/27/21

APPENDIX D

Health and Safety Plan (and Community Air Monitoring Plan)

Site-Specific Health and Safety Plan

408 West 207th Street
New York, New York
Block 2203 Lot 21

January 17, 2022

Prepared for:

Harlem River Ninth Avenue Development LLC
1865 Palmer Avenue
Larchmont, New York 10538

Prepared by:

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

2477.0008Y.107/CV

Environmental Consulting
& Management
+1.800.322.ROUX
rouxinc.com

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G. Generic Community Air Monitoring Plan (CAMP)

Site-Specific Emergency Information

Emergency Phone Numbers

Most emergency services can be obtained by calling **911**. Where 911 service is not available, use the telephone numbers provided in the below table. The following is a master emergency phone list for use by the project management personnel. A more condensed version of the emergency numbers listed below will be posted throughout project work areas. Emergencies encountered on the site will be responded to by a combination of off-site emergency services and on-site personnel.

Emergency Contact Information			
Site Personnel			
Title	**Contact**		**Telephone**
Office Manager (OM)	Brian Morrissey		631-232-2600
Project Principal (PP)	Jessica Taylor		631-766-0607
Project Manager (PM)	Valerie Sabatasso		516-509-9852
Site Supervisor (SS)	Julia Michaels		631-626-8831
Site Health and Site Safety Officer (SHSO)	Julia Michaels		631-626-8831
Office Health and Safety Manager (OHSM)	Kristina DeLuca		516-830-1189
Corporate Health and Safety Manager (CHSM)	Brian Hobbs		631-807-0193
AllOne Health	Occupational Health Care Management Provider		800-350-4511
Client Emergency Contact			
Outside Assistance			
Agency	**Contact**	**Telephone**	**Address/Location**
Ambulance/emergency medical services (EMS)	Lifecare Transport	911/718-543-3227	100 W Kingsbridge Rd, Bronx, NY
Police	NYPD 34th Precinct	911/212-927-9711	4295 Broadway, New York, NY
Fire	FDNY Engine 95/Ladder 36	911	29 Vermilyea Ave, New York, NY
Site Address	408 West 207th Street, New York, NY 10034		

Emergency Medical Facility

Route to New York-Presbyterian The Allen Hospital, 5141 Broadway, New York, NY (Figure 5):

- Head northwest on West 207th Street toward 10th Ave (240 feet)
- Turn right onto 10th Avenue (0.5 miles)
- Merge onto Broadway (459 feet)
- Turn left onto W 220th Street (236 feet)

- Turn left (164 feet)
- New York-Presbyterian The Allen Hospital will be on the left

Urgent Care Facility

Route to City MD Fordham Urgent Care Bronx, 388 E Fordham Road, Bronx, NY (Figure 5):

- Head southeast on W 207th Street toward 9th Avenue (0.2 miles)
- Continue onto University Heights Bridge (0.1 miles)
- Continue onto W Fordham Road (1.1 miles)
- City MD will be on the right

1. Introduction

This Site-specific Health and Safety Plan (HASP) has been prepared by Roux Environmental Engineering and Geology, D.P.C. (Roux) for use during the Remedial Action to be completed at the property occupying Block 2203 Lot 21, in the Borough of Manhattan, City and State of New York (Site, Figure 1). The Remedial Action will include construction oversight and sampling activities being performed by Roux as well as construction activities performed by general contractor. These activities fall within the scope of operations covered by the Occupational Safety and Health Administration (OSHA) standards promulgated at 29 CFR 1910.120 and 29 CFR 1926.65, both commonly referred to as the Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard. In accordance with the HAZWOPER Standard, this Site-specific HASP was prepared to address the safety and health hazards associated with the Phase II ESA activities being performed at the Site by Roux and to provide requirements and procedures for the protection of Roux employees, subcontractor personnel, government oversight personnel, Site personnel, and the general public. It also addresses client- and Site-specific requirements for health and safety.

Implementation of this HASP is the joint responsibilities of the project manager, the Site health and safety officer, and all field staff, with assistance from the project principal and the office health and safety manager. The Project Manager for this project is Valerie Sabatasso, the Site Health and Safety Officer and the Site Supervisor will be Julia Michaels.

This HASP will be introduced to, reviewed, and signed off on by all Roux personnel through a formal training session prior to commencing work. A copy of the HASP will be kept at the Site at all times. The Roux SHSO or PM will be responsible for posting any changes, amendments, memos, etc. to the HASP. Any revisions to this HASP will be signed by appropriate personnel, which can include Roux's PP, CHSM, and SS. Any changes will be announced to all workers at the next safety meeting.

1.1 Roles and Responsibilities

Overall Roles and Responsibilities (R&Rs) of Roux personnel are provided in Roux's Policies and Procedures Manual. Only those R&Rs specific to HASP requirements are listed below.

Project Manager (PM)

The PM has responsibility and authority to direct all work operations. The PM coordinates safety and health functions with the Site Health and Safety Officer (SHSO), has the authority to oversee and monitor the performance of the SHSO, and bears ultimate responsibility for the proper implementation of this HASP. The specific duties of the PM are:

- Preparing and coordinating the Site work plan;
- Providing Site supervisor(s) with work assignments and overseeing their performance; Coordinating safety and health efforts with the SSHO;
- Ensuring effective emergency response through coordination with the Emergency Response Coordinator (ERC); and
- Serving as primary Site liaison with public agencies and officials and Site contractors.

Site Health and Safety Officer (SHSO)

The SHSO has the full responsibility and authority to develop and implement this HASP and to verify compliance. The SHSO reports to the Project Manager. The SHSO is on Site or readily accessible to the Site during all work operations and has the authority to halt Site work if unsafe conditions are detected. The specific responsibilities of the SHSO include:

- Managing the safety and health functions on this Site;
- Serving as the Site's point of contact for safety and health matters;
- Ensuring Site monitoring, worker training, and effective selection and use of PPE;
- Assessing Site conditions for unsafe acts and conditions and providing corrective action;
- Assisting the preparation and review of this HASP;
- Maintaining effective safety and health records as described in this HASP; and
- Coordinating with the Site Supervisor(s) and others as necessary for safety and health efforts.

Site Supervisor

The Site Supervisor is responsible for field operations and reports to the Project Manager (PM). The Site Supervisor ensures the implementation of the HASP requirements and procedures in the field. The specific responsibilities of the Site Supervisor include:

- Executing the work plan and schedule as detailed by the PM;
- Coordination with the SHSO on safety and health; and
- Ensuring Site work compliance with the requirements of this HASP.

Employees

All Roux employees are responsible for reading and following all provisions of the Corporate Health and Safety Manual, including this HASP. Employees report to the SS at the project Site. Each employee is also responsible for the following:

- Wearing all appropriate PPE as outlined within this HASP;
- Attending all safety meetings;
- Inspecting tools and equipment prior to use, and taking any defective tools or equipment out of service;
- Appropriately documenting field events as they occur within a logbook or equivalent;
- Properly operating machinery and/or equipment only if trained to do so;
- Stopping work operations if unsafe conditions exist;
- Identifying and mitigating hazards when observed;
- Reporting all incidents and near misses to the Roux SHSO and SS immediately; and
- Knowing where emergency equipment is located (e.g. first aid kit, fire extinguisher).

Subcontractors and Visitors

Subcontractors and visitors are responsible for complying with the same health and safety requirements. It is the responsibility of all to make sure subcontractors and visitors comply and uphold the HASP. Subcontractors and visitors have the following additional responsibilities:

- Designating a qualified safety representative for the project that can make the necessary changes in work practices, as necessary;
- Attending all safety meetings while participating in Roux Site work activities;
- Reporting all incidents and near misses to Roux SHSO and SS immediately;
- Conducting initial and periodic equipment inspections in accordance with manufacturer and regulatory guidelines; and
- Providing copies of all Safety Data Sheets (SDS) to Roux SHSO for materials brought to the Site.

2. Background

The Site is located in the Inwood section of the Borough of Manhattan, City and State of New York. The Site is currently occupied by a parking lot.

2.1 Site Description

The Site is currently developed with an asphalt-paved parking lot. Nearby properties include residential and commercial buildings. The 207 Street Train Yard Facility is adjacent to the north of the Site. The proposed future use of the Site includes residential and commercial facility spaces.

2.2 Site History

Based on Roux's review of historical reports and documentation, the Site was undeveloped until 1926. From 1926 through 1969, the northern portion was occupied by a three-story commercial structure and an adjoining large swimming pool. An automobile garage was present and operated from 1926 through 1968. Also, from 1947 to 1968 a gasoline filling station was located on the northeastern area of the lot. By 1969, all structures had been demolished and construction for the paved parking lot areas were completed and remain present today.

2.3 Known and Potential Releases of Hazardous Substances at the Site

Based on a review of the historic data, NYSDEC opened a spill number for Lot 21.

3. Scope of Work

Based on information gathered as a result of previous ESAs, and the Remedial Investigation (RI) conducted in preparation for redevelopment, a Remedial Action Work Plan (RAWP) was developed. The proposed RAWP scope of work includes the following:

- Limited soil excavation by third-party contractor personnel necessary to achieve slab-on-grade foundation design depths;
- Excavation, loadout, and off-Site disposal of Site soils at permitted facilities;
- Import of approved backfill where necessary to achieve at least two-feet of clean cover;
- Installation of a composite cover system comprised of concrete building foundations and exterior paved surfaces; and
- Installation of a vapor barrier system beneath the proposed new building.

Non-routine activities that may be performed by Roux personnel include the following:

- Limited site inspections; and
- Oversight of Roux subcontractor personnel during disposal of investigation-derived waste.

If there are any changes with the scope a revision of the HASP will be required to address any new hazards.

4. Site Control

This Site control program is designed to reduce the spread of hazardous substances from contaminated areas to clean areas, to identify and isolate contaminated areas of the Site, to facilitate emergency evacuation and medical care, to prevent unauthorized entry to the Site, and to deter vandalism and theft.

4.1 Site Map

A map of this Site, showing Site boundaries, designated work zones, and points of entry and exit is provided in **Figure 2**.

4.2 Site Access

Access to the Site is restricted to reduce the potential for exposure to its safety and health hazards. Since the Site is an active grocery store and parking lot, an exclusion zone will be put up around the work area.

4.3 Buddy System

Site workers use the buddy system. The buddy system means that personnel work in pairs and stay in close visual contact to be able to observe one another and summon rapid assistance in case of an emergency. The responsibilities of workers using the buddy system include:

- Remaining in close visual contact with partner;
- Providing partner with assistance as needed or requested;
- Observing partner for signs of cold stress or other difficulties;
- Periodically checking the integrity of partner's PPE; and
- Notifying the Site personnel if emergency assistance is needed.

4.4 Site Communications

The following communication equipment is used to support on-site communication: visual hand signals will be used during use of the drill rig, and workers will have cell phones on-Site. Should multiple operations be occurring at the Site concurrently radios shall be issued for communication if determined to be necessary.

As applicable, hand signals will be used according to the following:

Hand Signals

SIGNAL	MEANING
Hand gripping throat	Out of air, can't breathe
Grip partner's wrist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	I'm all right, okay
Thumbs down	No, negative

A current list of emergency contact numbers is included in the Site-Specific Emergency Information at the beginning of this HASP.

4.5 Site Work Zones

The SOW does not require the implementation of work zones; however, should the need arise, this section provides details for the proper execution of work zones at this Site.

This Site is divided into three (3) major zones, described below. These zones are characterized by the likely presence or absence of biological, chemical, or physical hazards and the activities performed within them. Zone boundaries are clearly marked at all times and the flow of personnel among the zones is controlled. The Site is monitored for changing conditions that may warrant adjustment of zone boundaries. Zone boundaries are adjusted as necessary to protect personnel and clean areas. Whenever boundaries are adjusted, zone markings are also changed and workers are immediately notified of the change.

Exclusion Zone

The area where contamination exists is the Exclusion Zone (EZ). All areas where excavation and handling of contaminated materials take place are considered part of the EZ. This zone will be clearly delineated by chain link fencing, caution tape, cones or other effective barriers, as necessary. Safety tape may be used as a secondary delineation within the EZ. The zone delineation markings may be opened in areas for varying lengths of time to accommodate equipment operation or specific construction activities. The SHSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Personnel are not allowed in the EZ without:

- A buddy (co-worker);
- Required minimum level PPE;
- Medical authorization;
- Training certification; and
- Requirement to be in the zone.

Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) is established between the exclusion zone and the support zone. The CRZ contains the Contamination Reduction Corridor (CRC) and provides an area for decontamination of personnel and equipment. The CRZ will be used for general Site entry and egress in addition to access for heavy equipment and emergency support services. Personnel are not allowed in the CRZ without:

- A buddy (co-worker)
- Appropriate PPE
- Medical authorization
- Training certification
- Requirement to be in the zone

Support Zone

The Support Zone (SZ) is an uncontaminated area that will be the field support area for the Site operations. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

5. Job Hazard Evaluation

Roux's work at the Site is expected to entail a variety of physical, chemical, and biological hazards, all of which must be sufficiently managed to allow the work to be performed safely. Some of the hazards are Site-specific (i.e., they are associated with the nature, physical characteristics, and/or routine operation of the Site itself), while others are activity-specific (i.e., they are associated with [or arise from] the particular activity being performed). The various hazards can be grouped into the following categories:

- **Caught/Crushed** – the potential to become caught in, under, between, or by an object or parts of an object, such as equipment with parts that open and close or move up and down ("pinch points") or equipment that rotates, and the accompanying potential to have body parts cut, mangled, or crushed thereby.
- **Contact** – the potential to be struck by or against moving or stationary objects that can cause physical injury, such as heavy machinery, overhead piping, moving vehicles, falling objects, and equipment (including tools and hand-held equipment) or infrastructure with the ability to cut or impale.
- **Energy Sources** – the potential for bodily harm associated with energy sources, most notably electricity, but also including latent energy sources such as compressed air and equipment under tension (which when released could cause injurious contact or a fall).
- **Ergonomics** – the potential for musculoskeletal injury associated with lifting/carrying, pushing/pulling, bending, reaching, and other physical activity attributable to poor body position/mechanics, repetitive motion, and/or vibration.
- **Exposure** – the potential for injury/illness due to physical, chemical, or biological exposures in the work environment, including but not limited to temperature extremes, solar radiation, and noise (physical), chemical splashes and hazardous atmospheres (chemical), and animal/insect bites and poisonous plants (biological).
- **Falls** – the potential to slip or trip and thus fall or drop a load, resulting in bodily injury to oneself or others.

The foregoing is intended to provide Roux employees with a general awareness of the hazards involved with Site work. A more detailed review of the potential hazards associated with each specific activity planned for the Site (or on-going activity, as the case may be) is provided in the activity-specific Job Safety Analysis (JSA) forms in **Appendix A**. As can be seen in the JSA forms, the hazards are identified by category per the above, and specific measures designed to mitigate/manage those hazards are also identified. In preparing the JSA forms, all categories of hazards were considered, and all anticipated potential hazards were identified to the extent possible based on the experience of the personnel preparing and reviewing the JSA forms. However, there is always the possibility for an unanticipated hazard to arise, potentially as condition change over the course of the workday. Roux personnel must maintain a continual awareness of potential hazards in the work zone, regardless of whether the hazard is identified in the JSA form. Particular attention should be paid to hazards associated with exposure to hazardous substances (see **Table 1** for a listing of the hazardous substances most likely to be encountered in environmental media at the Site) and to Site personnel being located "in the line of fire" with respect to moving equipment, pinch points, and latent energy (e.g., being located or having body parts located within the swing radius of an excavator, between two sections of pipe being connected, below a piece of suspended equipment, or adjacent to a compressed air line).

5.1 Hazard Communication and Overall Site Information Program

The information in the JSAs and safety data sheets is made available to all employees and subcontractors who could be affected by it prior to the time they begin their work activities. Modifications to JSAs are communicated during routine pre-work briefings.

The information in the JSAs and Safety Data Sheets (SDSs) is made available to all employees and subcontractors who could be affected by an exposure to the hazards covered in them prior to the time they begin their work activities. Modifications to JSAs are communicated during routine pre-work briefings, and periodically updated as needed in the HASP. SDSs will be maintained by the SHSO/SS for new chemicals brought on-site as needed. Copies of SDSs can be found in **Appendix B**.

5.2 Noise

Noise is associated with the operation of heavy equipment, power tools, pumps, and generators. Noise is also a potential hazard when working near operating equipment such as excavators, drill rigs or pole drivers. High noise (i.e., < 85 dBA) operations may be evaluated by the SHSO utilizing a type 2 handheld sound level meter (SLM) operating on the "A"-weighted scale with slow response because this scale most closely resembles human response to noise and complies with OSHA 29 CFR 1910.95. Hearing protection is required in areas with noise exposure greater than 85 dBA. Double hearing protection (ear plugs and earmuffs) are required in areas where the noise exposure is more than 95 dBA. Noise exposure will be controlled by hearing protection as described above or by maintaining set-backs from high-noise equipment, as warranted. Personnel handling heavy equipment and using power tools that produce noise levels exceeding those described levels above are required by OSHA 29 CFR 1910.95 to wear the appropriate Noise Reduction Rating (NRR) level of hearing protection. Appropriate hearing protection will be evaluated by the SHSO as necessary in consultation with the OHSM and CHSM.

5.3 Biological Hazards

Biological hazards that may potentially be present at a Site, include poisonous plants, insects (ticks, spiders, bees), animals (snakes, dogs), etc. Information on biological hazards can be found within Roux's Biological Hazard Awareness Management Program located within Roux's Corporate Health and Safety Manual. There is also potential for transmission and/or exposure to SARS-CoV-2, the virus that causes COVID-19. Prior to beginning work, on-Site protocols shall be established by the project team, including subcontractors, in accordance with federal, state, county, city, and/or other guidance, as applicable and consistent with **Appendix C**. Government guidance/orders generally consist of implementation of the following protocols/procedures (or some variation thereof):

- Self-monitoring for symptoms;
- Fitness check for work each day;
- Limiting businesses to "essential" operations;
- Social distancing (generally 6 feet);
- Cloth face masks/ coverings;
- Hand washing/ disinfectant use; and
- Care/ awareness of surroundings (public spaces, equipment, hotel rooms, rental cars).

Additional guidance on minimizing potential exposure to SARS-CoV-2, including a JSA, are included in **Appendix C**.

6. Emergency Response Plan

This emergency response plan details actions to be taken in the event of Site emergencies. The PM and SHSO is responsible for the implementation of emergency response procedures onsite. The SHSO/PM provides specific direction for emergency action based upon information available regarding the incident and response capabilities and initiates emergency procedures and notification of appropriate authorities. In the event of an emergency, Site personnel are evacuated and do not participate in emergency response activities, response is facilitated through external emergency services.

6.1 Emergency Response

The SHSO, after investigating the incident and relevant information, shall determine the level of response required for containment, rescue and medical care. Limited on-site emergency response activities could occur therefore the SHSO is responsible for notifying external emergency response agencies. The SHSO provides relevant information to the responding organizations, including but not limited to the hazards associated with the emergency incident, potential containment problems, and missing Site personnel.

6.2 Emergency Alerting and Evacuation

If evacuation notice is given, Site workers leave the worksite, if possible, by way of the nearest exit. Appropriate primary and alternate evacuation routes and assembly areas have been identified and are shown on the Site Plan with Emergency Muster Area (**Figure 2**). The routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by SHSO/PM.

Personnel exiting the Site gather at a designated assembly point. To determine that everyone has successfully exited the Site, personnel will be accounted for at the assembly point. If any worker cannot be accounted for, notification is given to the SHSO, PM, and any arriving response authorities so that appropriate action can be initiated. Subcontractors on this Site have coordinated their emergency response plans to ensure that these plans are compatible and potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying upon them.

6.3 Emergency Medical Treatment and First Aid

In the event of a work-related injury or illness, employees are required to follow the procedures outlined below. All work-place injury and illness situations require Roux's Project and Corporate Management Team to be notified when an injury/illness incident occurs, and communication with the contracted Occupational Health Care Management Provider, AllOne Health (AOH), is initiated. The Injury/Illness Notification Flowchart is provided below and within Roux's Incident Investigation and Reporting program included within Roux's Corporate Health and Safety Manual.

If on-Site personnel require any medical treatment, the following steps will be taken:

a. Notify Roux's Project and Corporate Management Team for any work-related injury and/or illness occurrence, and communicate with the contracted Occupational Health Care Management Provider, AOH, immediately following the notifications provided above.

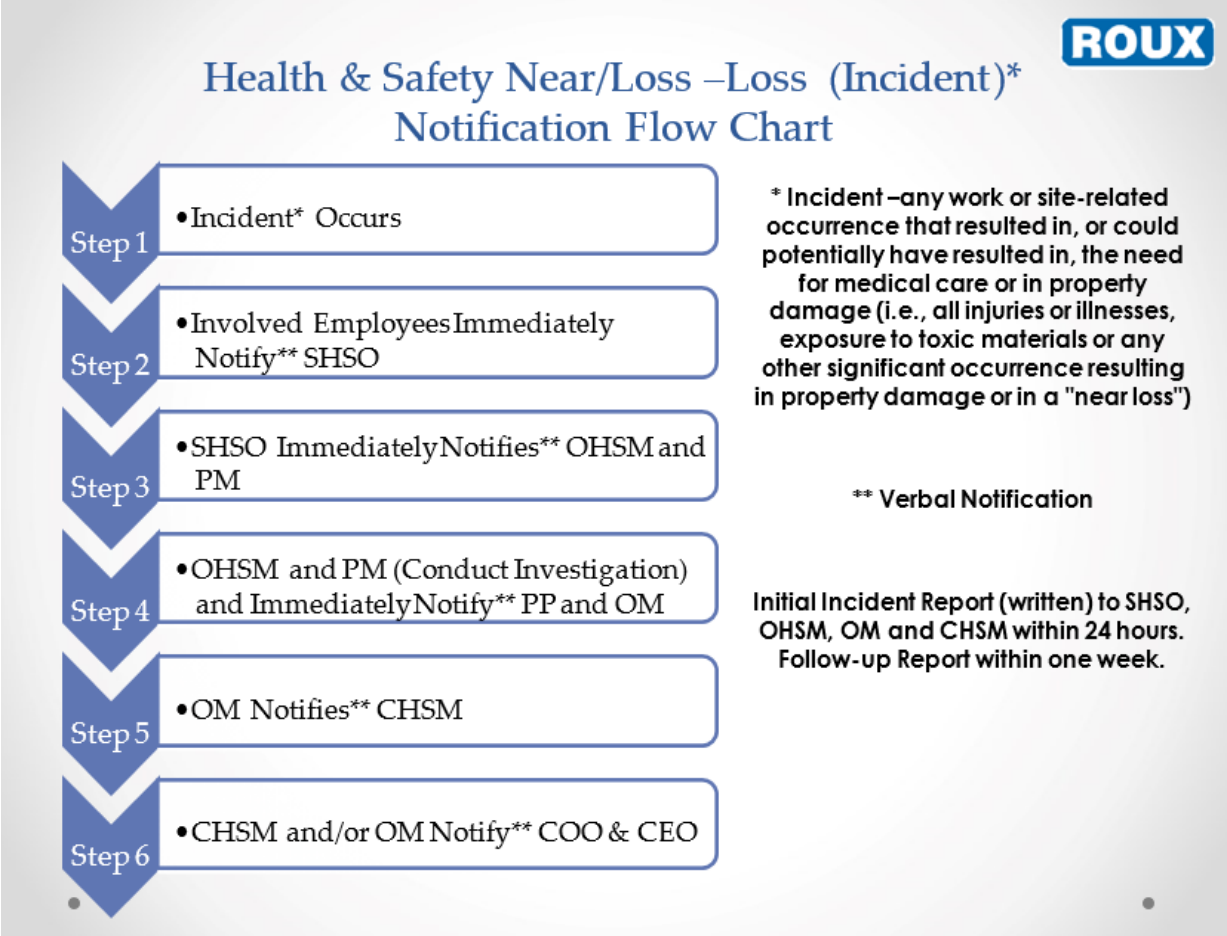
b. Based on discussions with the Project Team, Corporate Management and the AOH evaluation, if medical attention beyond onsite First Aid is warranted, transport the injured / ill person (IP) to the

Urgent Care Center, or notify the Fire Department or Ambulance Emergency service and request an ambulance or transport the victim to the hospital, and continue communications with Corporate Management Team. An Urgent Care/Hospital Route map with location to City MD Fordham Urgent Care Bronx and the New York – Presbyterian The Allen Hospital is included as **Figure 3**.

c. Decontaminate to the extent possible prior to administration of first aid or movement to medical or emergency facilities.

d. First aid medical support will be provided by onsite personnel trained and certified in First Aid, Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillation (AED), and Blood-Borne Pathogens (BBP) Awareness, until relieved by emergency medical services (EMS).

e. The SHSO and Project Manager will perform a Loss Investigation (LI) and the Project Team will complete the final Loss Report. If a Roux employee is involved in a vehicular incident, the employee must also complete the Acord Automobile Loss Notice.



6.4 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO or project principal will determine if work can continue without sacrificing the health and safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries;
- Potential for cold stress and cold-related injuries;

- Treacherous weather-related conditions;
- Limited visibility; and
- Electrical storm potential.

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lightning. Observe daily weather reports and evacuate if necessary in case of inclement weather conditions.

6.5 Electrical Storm Guidelines

In the event that lightning and/or thunder are observed while working onsite, all onsite activities shall stop and personnel shall seek proper shelter (e.g., substantial building, enclosed vehicle, etc.). Work shall not resume until the threat of lighting has subsided and no lightning or thunder has been observed for 30 minutes. If the possibility of lightning is forecast for the day, advise the onsite personnel on the risks and proper procedure at the pre-work safety briefing. Continuously monitor for changing weather conditions and allow enough time to properly stop work if lightning is forecast.

7. Safety Procedures

This section of the HASP presents the specific safety procedures to be implemented during Roux's activities at the Site in order to protect the health and safety of various on-site personnel. Minimum OSHA-mandated procedures are presented first, followed by client- and Site-specific procedures. Lastly, activity-specific procedures are discussed. These Site and activity-specific procedures supplement the general safety procedures included in Roux's Corporate Health and Safety Manual, which also must be followed in their entirely.

7.1 Training

At a minimum, Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety-trained prior to performing work onsite per OSHA 29 CFR 1910.120(e) and 29 CFR 1926.65(e). More specifically, all Roux, subcontractor, and other personnel engaged in sampling and remedial activities at the Site and who are exposed or potentially exposed to hazardous substances, health hazards, or safety hazards must have received at a minimum the 40 hour initial HAZWOPER training consistent with the requirements of 29CFR 1910.120(e)(3)(i) training and a minimum of 3 days' actual field experience under the direct supervision of a trained experienced supervisor, plus 8 hours of refresher training on an annual basis. Depending on tasks performed, less training may be permitted. Evidence of such training must be maintained at the Site at all times. Furthermore, all on-Site management and supervisory personnel directly responsible for or who supervise the employees engaged in Site remedial operations, must have received an additional 8 hours of specialized training at the time of job assignment on topics including, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques, plus 8 hours of refresher training on an annual basis.

Roux personnel training records are maintained in a corporate database with records available upon request from either the OHSM/SHSO/CHSM or Human Resources Department.

7.2 Site-Specific Safety Briefings for Visitors

A site-specific briefing is provided to all site visitors who enter this site beyond the site entry point. For visitors, the site-specific briefing provides information about site hazards, the site lay-out including work zones and places of refuge, the emergency alarm system and emergency evacuation procedures, and other pertinent safety and health requirements as appropriate.

7.3 HASP Information and Site-Specific Briefings for Workers

Site personnel review this HASP and are provided a Site-specific tailgate briefing prior to the commencement of work to ensure employees are familiar with this HASP and the information and requirements it contains, as well as the relevant JSAs included in **Appendix A**. Additional briefings are provided as necessary to notify employees of any changes to this HASP as a result of information gathered during on-going Site characterization and analysis of changing conditions. Conditions for which we schedule additional briefings include, but are not limited to: changes in site conditions, changes in the work schedule/plan, newly discovered hazards, and incidents occurring during Site work.

7.4 Medical Surveillance

The medical surveillance section of the Health and Safety Plan describes how worker health status is monitored at this site. Medical surveillance is used when there is the potential for worker exposure to hazardous substance at levels above OSHA permissible exposure limits or other published limits. The purpose of a medical surveillance program is to medically monitor worker health to ensure that personnel are not adversely affected by site hazards. The provisions for medical surveillance at this site are based on the site characterization and job hazard analysis found in Section 4 of this HASP and are consistent with OSHA requirements in 29 CFR 1910.120(f) as applicable.

7.4.1 Site Medical Surveillance Program

Medical surveillance requirements are based on a worker's potential for exposure as determined by the site characterization and job hazard analysis documented in Section 4 and JSAs within **Appendix A** of this HASP and in compliance with the requirements of 29 CFR 1910.120(f)(2). Based on site information and use of direct reading instruments, limited use of respirators (less than 30 days per year), and the absence of an employee-staffed HAZMAT team, a limited medical surveillance program is required and implemented at this site. The medical surveillance program provides that:

1. Workers assigned to tasks requiring the use of respirators receive medical examinations in accordance with 29 CFR 1910.134(e) to ensure they are physically capable to perform the work and use the equipment, and
2. If a worker is injured, becomes ill, or develops signs or symptoms of possible over-exposure to hazardous substance or health hazards, medical examinations are provided to that worker as soon as possible after the occurrence and as required by the attending physician.
3. These medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to workers free of cost, without loss of pay, and at a reasonable time and place. In addition, the need to implement a more comprehensive medical surveillance program will be re-evaluated after any apparent over-exposure.

7.4.2 Medical Recordkeeping Procedures

Medical recordkeeping procedures are consistent with the requirements of 29 CFR 1910.1020 and are described in the company's overall safety and health program. A copy of that program is available at our Islandia, New York office.

The following items are maintained in worker medical records:

- Respirator fit test and selection;
- Physician's medical opinion of fitness for duty (pre-placement, periodic, termination);
- Physician's medical opinion of fitness for respirator protection (pre-placement, periodic); and
- Exposure monitoring results.

7.4.3 Program Review

The medical program is reviewed to ensure its effectiveness. The Corporate Health and Safety Manager in coordination with the Human Resources Director is responsible for this review. At minimum, this review consists of:

- Review of accident and injury records and medical records to determine whether the causes of accidents and illness were promptly investigated and whether corrective measures were taken wherever possible;
- Evaluation of the appropriateness of required medical tests based on site exposures; and
- Review of emergency treatment procedures and emergency contacts list to ensure they were site-specific, effective, and current.

7.5 Personnel Protection

Site safety and health hazards are eliminated or reduced to the greatest extent possible through engineering controls and work practices. Where hazards are still present, a combination of engineering controls, work practices and PPE are used to protect employees. Appropriate personal protective equipment (PPE) shall be worn by Site personnel when there is a potential exposure to chemical hazards or physical hazards (e.g., falling objects, flying particles, sharp edges, electricity, and noise), as determined by the SHSO. The level of personal protection, type and kind of equipment selected will depend on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors will be made before work can be safely executed.

Roux maintains a comprehensive written PPE program that addresses proper PPE selection, use, maintenance, storage, fit and inspection. Roux's PPE program can be found within **Appendix D**. PPE to be used at the Site will meet the appropriate American National Standards Institute (ANSI) standards and the following OSHA (General/Construction Industry) standards for minimum PPE requirements.

The minimum level of PPE for entry onto the Site is Level D. The following equipment shall be worn:

- Work uniform (long pants, sleeved shirt);
- Hard hat;
- Steel or composite toe work boots;
- Safety Glasses (must comply with one of the following ANSI/ISEA Z87.1-2010, ANSI Z87.1-2003, ANSI Z87.1-2003);
- Boot Covers (as needed);
- Hearing protection (as needed);
- High visibility clothing (shirt/vest); and
- Hand protection (e.g., minimum cut resistance meeting ANSI 105-2000 Level 2).

Note that jewelry shall be removed or appropriately secured to prevent it from becoming caught in rotating equipment or unexpectedly snagged on a fixed object (e.g., wrist watches, bracelets, rings, chains and necklaces, open earrings). Do not wear loose clothing and all shoulder-length hair should be tied back.

Site specific PPE ensembles and materials are identified within task specific JSAs located within **Appendix A**, and any upgrades or downgrades of the level of protection (i.e., not specified in the JSA) must be approved by the PP and immediately communicated to all Roux personnel and subcontractors as applicable. PPE is used in accordance with manufacturer's recommendations.

7.5.1 Hearing Conservation

Hearing protection is made available when noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 dBA. Hearing protection is required when the 8-hour time weighted average sound level ≥ 90 dBA. Where noise exposure meets or exceeds this level, noise is listed as a physical hazard in the JSA for the tasks/operation, and hearing protection is included as one of the control measures (PPE).

7.6 Monitoring

An air monitoring program is important to the safety of on- and off-Site personnel. A preliminary survey, to establish background conditions in the immediate sampling area, may be made prior to the initiation of Site work including, but not limited to, monitoring wind direction and approximate temperature during all invasive Site activities. This survey will be conducted with the appropriate air monitoring instrument(s) as warranted by the field activity. Once this survey has been complete, any change in the type of PPE will be determined.

Air monitoring may be performed to verify that the proper level of equipment is used and to determine if increased protection or work stoppage is required. The following equipment may be used to monitor conditions:

- Photoionization Detector (PID)

Monitoring equipment will be calibrated in accordance with applicable regulatory requirements and manufacturer specifications. Below are monitoring action levels for Site-specific chemicals of concern. In the event that PID readings above the thresholds identified below are sustained for 5 minutes in the breathing zone, worker protection will require upgrading following notification to the OHSM and applicable parties (e.g., client, board of health, regulators, etc.).

7.6.1 Action Levels for Air Monitoring

PPE can remain at Level D if breathing zone VOC concentrations are less than 5 ppm and benzene is non-detect. Personnel are required to evacuate the Site when breathing zone VOC readings exceed 25 ppm.

The following tables include summaries of the air monitoring, work practices, and action levels for the expected contaminants. The action levels to initiate testing with colorimetric tubes for airborne volatiles is 1 ppm (PID reading) and is based on the Permissible Exposure Limit (PEL) for benzene (1 ppm). The colorimetric tubes are used to confirm the presence or absence of specific constituents, and they do not provide a measured concentration.

Air Monitoring Summary and Action Levels Organic Vapors	
PID Reading in Breathing Zone (ppm)[1]	**Action**
0-1 ppm above background[2]	Continue monitoring
1-5 ppm sustained 60 seconds	Continue monitoring, if applicable initiate additional collection of benzene using colorimetric tubes.
<5 ppm and no presence of benzene	Continue Monitoring, ventilate space

Air Monitoring Summary and Action Levels Organic Vapors	
PID Reading in Breathing Zone (ppm)[1]	**Action**
≥ 5 ppm - ≤ 25 ppm and no presence of benzene	Ventilate space until PID reads < 5 ppm. If < 5 ppm cannot be achieved, upgrade to Level C[3].
≥ 25 ppm	Ventilate space and evacuate area.

[1] Based on relative response/sensitivity of PID to benzene.
[2] Background concentrations should be established at the beginning of each work day. It may be necessary to re-establish background concentrations and ambient conditions vary through the day.
[3] Measured air concentrations of known organic vapors will be reduced by the respirator to one half of the PEL or lower, and the individual and combined compound concentrations shall be within the service limit of the respirator cartridge.

7.6.2 Air Monitoring Equipment and Calibration

A PID calibrated to an appropriate calibration mixture will be used to detect organic vapors in and around the work areas. Monitoring will be conducted in and around all work areas and at the workers breathing zone before activities commence to establish a background level, then at 15-minute intervals throughout the day. All equipment will be calibrated according to the manufacturer's recommendation. A calibration log will be maintained and will include the name of the person who performed the calibration, the date and time calibrated, and the instrument reading at the time of calibration. A manual bellows pump or equivalent with colorimetric tubes for formaldehyde will be utilized to determine the course of action related to upgrading or downgrading the level of respiratory protection, as applicable.

If air monitoring data indicate safe levels of potentially harmful constituents at consistent intervals (5-minute intervals), then monitoring can be conducted less frequently (every 30 minutes). This determination will be made by the onsite SHSO. Monitoring data, including background readings and calibration records, will be documented. Work to be performed on-Site will conform to Roux's Standard Operating Procedures (SOPs). Conformance with these guidelines as well as the guidelines described in this HASP will aid in mitigating the physical and chemical hazards mentioned throughout this HASP.

7.7 Tailgate Safety Meetings

A designated Site worker will provide daily safety briefings (e.g., tailgate meetings) including, but not limited to, the following scenarios:

- When new operations are to be conducted;
- Whenever changes in work practices must be implemented; and
- When new conditions are identified and/or information becomes available.

Daily safety briefings shall be recorded on the Roux Daily Tailgate Health and Safety Meeting Log/Daily Site Safety Checklist, and all completed forms will become a part of the project file.

7.8 Spill Containment

Spill containment equipment and procedures should, at a minimum, meet the requirements of the facility's Spill Prevention, Control and Countermeasure Plan, if applicable. Otherwise, spill containment equipment

and procedures must be considered depending on the task including, but no limited to, chemical/product transfer points and handling.

7.8.1 Initial Spill Notification and Response

Any worker who discovers a hazardous substance spill will immediately notify Jessica Taylor, Project Principal. The worker will, to his/her best ability, report the hazardous substance involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, and any associated injuries without compromising their own safety.

7.8.2 Spill Evaluation and Response

Julia Michaels/Site Supervisor and Site Health and Safety Officer is responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area will be isolated and demarcated to the extent possible. If necessary to protect nearby community members, notification of the appropriate authorities is made by the PM as appropriate. On-Site response is limited to small spills (e.g., <10 gallons); large spills require external emergency responders who will be contacted by the SHSO.

7.9 Decontamination

The decontamination section of the HASP describes how personnel and equipment are decontaminated when they leave the Exclusion Zone. This section also describes how residual waste from decontamination processes is disposed. The site decontamination procedures are designed to achieve an orderly, controlled removal or neutralization of contaminants that may accumulate on personnel or equipment. These procedures minimize worker contact with contaminants and protect against the transfer of contaminants to clean areas of the site and off-site. They also extend the useful life of PPE by reducing the amount of time that contaminants contact and can permeate PPE surfaces. Decontamination is facilitated within the CRZ at this site, if applicable.

7.9.1 Decontamination Procedures for Personnel and PPE

The following are general decontamination procedures established and implemented at this site.

1. Decontamination is required for all workers exiting a contaminated area. Personnel may re-enter the SZ only after undergoing the decontamination procedures described below in the next section.
2. Protective clothing is decontaminated, cleaned, laundered, maintained and/or replaced as needed to ensure its effectiveness.
3. PPE used at this site that requires maintenance or parts replacement is decontaminated prior to repairs, or
4. PPE used at this site is decontaminated or prepared for disposal on the premises. Personnel who handle contaminated equipment have been trained in the proper means to do so to avoid hazardous exposure.
5. This site uses an off-site laundry for decontamination of PPE. The site has informed that facility of the hazards associated with contaminated PPE from this site.
6. The site requires and trains workers that if their permeable clothing is splashed or becomes wetted with a hazardous substance, they will immediately exit the work zone, perform applicable decontamination procedures, shower, and change into uncontaminated clothing.
7. Procedures for disposal of decontamination waste meet applicable local, State, and Federal regulations.

7.9.2 Decontamination Procedures for Equipment

All tools, equipment, and machinery from the EZ or CRZ are decontaminated in the CRZ prior to removal to the SZ. Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure and to avoid cross-contamination and chemical incompatibilities.

General Equipment Decontamination Procedures:

1. Decontamination is required for all equipment exiting a contaminated area. Equipment may re-enter the SZ only after undergoing the equipment decontamination procedures.
2. Vehicles that travel regularly between the contaminated and clean areas of the site are carefully decontaminated each time they exit the EZ and the effectiveness of that decontamination is monitored to reduce the likelihood that contamination will be spread to other parts of the site.
3. Particular attention is given to decontaminating tires, scoops, and other parts of heavy equipment that are directly exposed to contaminants and contaminated soil.

The following items may be used to decontaminate equipment:

- Fresh water rinse;
- Non-phosphorus detergent wash;
- Distilled water rinse;
- Acetone rinse;
- Distilled water rinse; and
- A steam cleaner or pressure washer (heavy equipment only).

7.9.3 Monitoring the Effectiveness of Decontamination Procedures

Visual examination and sampling are used to evaluate the effectiveness of decontamination procedures. Visual examination is used to ensure that procedures are implemented as described and that they appear to control the spread of contaminants under changing site conditions. Visual examination is also used to inspect for signs of residual contamination or for contaminant permeation of PPE.

Personnel who work in contaminated areas of the site, either the Contamination Reduction Zone (CRZ) or the Exclusion Zone, are trained in the principles and practices of decontamination described in this section of the HASP and in related SOPs. If site procedures are changed as a result of inspection and monitoring, all affected employees are notified of these changes.

7.10 Confined Space Entry

Confined entry will not be performed at the Site.

The following is a list of the safety requirements for confined space entry at the Site:

- **ROUX PERSONNEL ARE NOT AUTHORIZED TO ENTER AN OSHA PERMIT REQUIRED CONFINED SPACE;**
- Currently the scope of work **DOES NOT** require personnel to enter permitted confined space for this project; and
- Any changes to the field activities that may necessitate confined space entry will be reported to the Project Principal and OHSM.

Confined space is defined as any space, depression, or enclosure that:

- Has limited opening for entry and egress;
- Is large enough for and employee to enter and perform assigned work; and
- Is not intended for continuous occupancy.

A permit required confined space is one that meets the definition of a confined space and has one or more of the following characteristics:

- May contain or produce life-threatening atmospheres due to oxygen deficiency the presence of toxic, flammable, or corrosive contaminants;
- Contains a material that has the potential for engulfment;
- Has an internal configuration that may cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section; and
- Contains any other serious safety or health hazards.

Although Roux personnel will not perform confined space entry, it is expected that subcontractors performing cleaning and mitigation and/or remedial measures activities may be required to enter structures that are considered to be a permit required confined space. Permitting of the confined space as well as hazard mitigation for entry will be completed by the subcontractor in accordance with 1910.146.

7.11 Client and Site-Specific

In addition to the OSHA-specific procedures discussed above, there may be client and site-specific safety procedures that must be adhered to during the performance of remedial activities at the Site.

7.12 Unusual or Significant Risks

Field activities that appear to have unusual or significant risks that cannot be adequately managed with existing risk tools such as LPS, HASPs, traffic safety plans, work permits, design and O&M practices, equipment HAZOPS or other safety tools must be referred to the CHSM to help with the assessment and management of the associated potential safety risks. Examples include the use of explosives for demolition, use of firearms to control wildlife, rappelling, demolition over water, diving, etc.

7.13 Activity-Specific Hazards

In addition to the general hazards discussed above, there are activity-specific hazards associated with each work activity planned for the Site. An activity-specific JSA has been completed for each of the activities planned for the Site. JSAs are provided in **Appendix A**. In the event that new work activities or tasks are planned, JSAs will be developed and implemented prior to performing the new activities. In the absence of a JSA, the personnel performing work must prepare a field JSA and receive clearance from a designated competent safety official prior to performing any task with significant risk. In emergency situations where time is critical SPSAs will be utilized to identify the task, associated hazards and mitigative actions to take. For lower risk activities (as deemed by the discretion of a Competent Person) where a JSA is determined to not be needed, the individual(s) conducting the activities must perform SPSAs prior to and during the work.

7.13.1 Electrical and Other Utility Assessment and Accommodations

Roux shall perform a site walk to identify any potential overhead electrical or utility lines. All applicable guidelines will be followed in the vicinity of overhead power and utility lines (see Section 7.13.3 below). Roux has also reviewed all available Site maps showing buried utility lines to identify potential hazards, which revealed that no underground hazards are known to exist in the vicinity of the areas of the Site pertinent to this HASP.

Roux subcontractor, AARCO called in a request to 811 to the prior to digging activities.

7.13.2 Subsurface Work

Subsurface work activities will require adherence to Roux's Corporate Subsurface Utility Clearance Management program found within **Appendix E**.

7.13.2.1 Excavations and Trenching

Excavation/trenching will not be part of this phase of work.

7.13.3 Heavy Equipment

Use of heavy equipment at the Site will require adherence to Roux's Corporate Heavy Equipment Exclusion Zone Management Program found within **Appendix F**. Additionally, operation of the drill rig/other heavy equipment will maintain clearances from overhead power lines in accordance with OSHA 29 CFR1926.1408 Table A Minimum Clearance Distances provided below.

Minimum Required Clearances for Energized Overhead Power Lines

Nominal System Voltage of Power Line (K V)	Minimum Required Clearance (feet)
0-50	10
51-100	12
101-200	15
201-300	20
301-500	25
501-750	35
751-1000	45

1 kilovolt (KV) = 1,000 volts

7.14 Heat Stress

The National Oceanic and Atmospheric Administration records average minimum/maximum temperatures of 27-83degrees Fahrenheit during the year in Inwood, New York.

7.14.1 Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment in hot weather environments. Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat stress are as follows:

- Severe muscle cramps, usually in the legs and abdomen;

- Exhaustion, often to the point of collapse; and
- Dizziness or periods of faintness.

First aid treatment includes, but is not limited to, shade, rest, and fluid replacement. Typically, the individual should recover within one-half hour while being monitored constantly. If the individual has not improved substantially within 30 minutes and the body temperature has not decreased, the individual should be transported to a hospital for medical attention.

7.14.2 Heat Exhaustion

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin to rid the body of excess heat through transference. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin with heavy perspiration;
- Skin appears pale;
- Fatigue and weakness;
- Dizziness; and
- Elevated body temperature.

First aid treatment includes, but is not limited to, cooling the victim, elevating the feet, and replacing fluids.

If the individual is not substantially improved within 30 minutes and the body temperature has not decreased, the individual should be transported to the hospital for medical attention.

7.14.3 Heat Stroke

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a MEDICAL EMERGENCY requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- Dry, hot red skin;
- Body temperature approaching or above 105 degrees F;
- Confusion, altered mental state, slurred speech;
- Seizures;
- Large (dilated) pupils; and
- Loss of consciousness – the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility. Heat stress is a significant hazard if any type of protective equipment (semi-permeable or impermeable) that prevents evaporative cooling when worn in hot weather environments.

7.15 Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole-body protection. Adequate insulating clothing must be used when the air temperature is below 60°F. A work/rest regimen will be initiated when ambient temperatures and protective clothing cause a stressful situation. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. The signs and symptoms of cold stress include the following:

- Severe shivering;
- Abnormal behavior;
- Slowing;
- Weakness;
- Stumbling or repeated falling;
- Inability to walk;
- Collapse; and/or
- Unconsciousness.

First aid requires removing the victim from the cold environment and seeking medical attention immediately. Also, prevent further body heat loss by covering the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks and encourage activity such as walking, wrapped in a blanket.

8. Field Team Review

Each person performing work at or visiting this site shall sign this section after site-specific training is completed and before being permitted to access the CRZ or Exclusion Zone.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provision contained therein.

Site/Project: 408 West 207th Street

Name & Company	Signature	Date

9. Approvals

By their signature, the undersigned certify that this HASP is approved and will be utilized at the **408 West 207th Street** Site.

Julia Michaels – Site Health and Safety Officer	Date
Kristina DeLuca - Office Health and Safety Manager	Date
Valerie Sabatasso – Project Manager	Date
Jessica Taylor – Project Principal	Date

TABLES

1. Toxicological Properties of Hazardous Substances Present at the Site

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at MHANY Chestnut Commons, Brooklyn, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Acenaphthene	83-32-9	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Brown solid
Acenaphthylene	208-96-8	None Established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Yellow Solid Fl. Pt.=251°F
Arsenic (inorganic)	7440-38-2 (metal)	TWA 0.01 mg/m3	Ca C 0.002 mg/m3 [15-min]	TWA 0.010 mg/m3	Ca [5 mg/m3 (as As)]	Inhalation; ingestion; skin absorption; skin and/or eye contact	Ulceration of nasal septum, dermatitis, GI disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]	Liver, kidneys, skin, lungs, lymphatic sys	Metal: sliver-gray or tin-white, brittle, odorless solid BP: sublimes
Barium	7440-39-3	TWA 0.5 mg/m3	None established	TWA 0.5 mg/m3	None established	Inhalation, ingestion, skin contact	Irritation skin, respiratory system, digestive system	Skin, eyes, respiratory system	Yellow white powder BP: 1640 C
Benzene	71-43-2	TWA 0.5 ppm STEL 2.5 ppm	Ca TWA 0.1 ppm STEL 1 ppm	TWA 1 ppm ST 5 ppm	Ca [500 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Colorless to light yellow liquid with an aromatic odor [Note: Solid below 42 °F] BP: 176°F Fl.Pt. = 12°F LEL: 1.2% UEL: 7.8% Class B Flammable liquid
Benzo[a]anthracene	56-55-3	None established [skin cancer]	None established	None established	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	Irritation eyes, skin, respiratory system, CNS; skin cancer	Skin	Pale Yellow crystal, solid BP: 438 C
Benzo[a]pyrene	50-32-8	None established [cancer]	TWA 0.1 mg/m3	TWA 0.2 mg/m3	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	POISON. This material is an experimental carcinogen, mutagen, tumorigen, neoplastigen and teratogen. It is a probable carcinogen in humans and a known human mutagen. IARC Group 2A carcinogen. It is believed to cause bladder, skin and lung cancer. Exposure to it may damage the developing fetus. May cause reproductive damage. Skin, respiratory and eye irritant or burns.	Skin, eye, bladder, lung, reproductive	Yellow crystals or powder [found in cigarette smoke, coal tar, fuel exhaust gas and in many other sources] BP: 495 C
Benzo[b]fluoranthene	205-99-2	None established [cancer]	TWA 0.1 mg/m3	TWA 0.2 mg/m3	None established	Inhalation; ingestion; skin and/or eye contact	No data were identified on the toxicity of benzo[b]fluoranthene to humans. Based on results of studies in animals, IARC concluded that benzo[b]fluoranthene is possibly carcinogenic to humans	Respiratory system, skin, bladder, kidneys	Off-white to tan powder
Benzo[k]fluoranthene	207-08-9	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory tract, gastrointestinal; fatal if swallowed, inhaled, absorbed through the skin; vomiting, nausea, diarrhea	Lungs, respiratory system	Yellow crystals BP: 480 C
Benzo(g,h,i)perylene	191-24-2	None established	None established	California permisible exposure limits for chemical contaminants (Title 8, Article 107) PEL 0.2 mg/m3	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory tract, very toxic to aquatic life with long lasting effects	Eyes, skin, respiratory system	Pale Yellow -Green Crystals BP: 550°C
Beryllium	7440-41-7 (metal)	TWA 0.00005 mg/m^3	Ca C 0.0005 mg/m^3	TWA 0.002 mg/m^3 C 0.005 mg/m^3 (30 minutes) with a maximum peak of 0.025 mg/m^3	Ca [4 mg/m^3 (as Be)]	inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	Metal: A hard, brittle, gray-white solid. BP: 4532°F
Cadmium	7440-43-9 (metal)	TWA 0.01 mg/m^3	Ca	TWA 0.005 mg/m^3	Ca [9 mg/m^3 (as Cd)]	inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	respiratory system, kidneys, prostate, blood	Metal: Silver-white, blue-tinged lustrous, odorless solid. BP: 1409°F
Carbon Tetrachloride	56-23-5	TWA 5 ppm STEL 10 ppm	Ca ST 2 ppm (12.6 mg/m3) [60 minute]	TWA 10 ppm C 25 ppm 200 ppm (5-minute maximum peak in any 4 hours)	Ca [200 ppm]	inhalation, skin absorbtion, ingestion, skin and/or eye contact	irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]	central nervous system, eyes, lungs, liver, kidneys, skin	Colorless liquid with a characteristic ether-like odor. BP: 170°F
Carbon Monoxide	630-08-0	TWA 25 ppm	TWA 35 ppm C 200 ppm	TWA 50 ppm	1,200 ppm	inhalation	Carboxyhemogloemia	Blood	Colorless, odorless gas

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at MHANY Chestnut Commons, Brooklyn, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Chromium	7440-47-3	TWA 0.5 mg/m^3 (metal and Cr III compounds) TWA 0.05 mg/m^3 (water-soluble Cr VI compounds) TWA 0.01 mg/m^3 (insoluble Cr IV compounds)	TWA 0.5 mg/m^3	TWA 1 mg/m^3	250 mg/m^3 (as Cr)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid. BP: 4788°F
Chrysene; Phenanthrene; Pyrene; Coal tar pitch volatiles	65996-93-2	TWA 0.2 mg/m3	Ca TWA 0.1 mg/m^3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m^3 (benzene-soluble fraction)	Ca [80 mg/m^3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
Coal Tar Pitch Volatiles; Chrysene; Phenanthrene; Pyrene	65996-93-2	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m^3 (benzene-soluble fraction)	Ca [80 mg/m^3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
1,1-Dichloroethane	75-34-3	TWA 100 ppm	TWA 100 ppm (400 mg/m^3)	TWA 100 ppm (400 mg/m^3)	3000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation skin; central nervous system depression; liver, kidney, lung damage	Skin, liver, kidneys, lungs, central nervous system	Colorless, oily liquid with a chloroform-like odor. BP: 135°F Fl.P: 2°F UEL: 11.4% LEL: 5.4%
1,2-Dichloroethane (Ethylene Dichloride)	107-06-2	TWA 10 ppm	Ca TWA 1 ppm (4 mg/m^3) STEL 2 ppm (8 mg/m^3)	TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]	Ca [50 ppm]	inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.] BP: 182°F Fl.P: 56°F UEL: 16% LEL: 6.2% Class IB Flammable Liquid
1,2-Dichloroethene (total)	540-59-0	TWA 200 ppm	TWA 200 ppm (790 mg/m^3)	TWA 200 ppm (790 mg/m^3)	1000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor BP: 118-140°F Fl.P: 36-39°F UEL: 12.8% LEL: 5.6% Class IB Flammable Liquid
cis-1,2-Dichloroethene	156-59-2	TWA 200 ppm	TWA 200 ppm	TWA 200 ppm	None established	inhalation, skin absorption, ingestion	Harmful if swallowed, inhaled, or absorbed through skin. Irritant. Narcotic. Suspected carcinogen	Skin	Colorless liquid BP: 60 C Fl.P: 4 C UEL: 12.8% LEL: 9.7 %
trans-1,2-Dichloroethene	156-60-5	TWA 200 ppm	None established	TWA 200 ppm STEL 250 ppm (skin)	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Narcotic. Irritation eyes, skin, respiratory tract, mucous membrane; CNS depression.	Respiratory tract, mucous membrane, eyes, skin, CNS	Colorless liquid with a fruity pleasant odor BP: 48°C Fl.P 6C UEL: 12.8% LEL: 9.7%
Dibenzo[a,h]anthracene	53-70-3	None established	None established	None established	None established	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin	Eyes, skin; skin photosensitization.	Colorless crystalline powder BP: 524°C
Dibenzofuran	132-64-9								
Diesel Fuel #2	68476-34-6	TWA 100 mg/m^3; Skin notation	None established	Designated as an OSHA Select Carcinogen	None established	ingestion, skin and/or eye contact	Kidney damage; potential lung damage; suspected carcinogen; irritation of eyes, skin, respiratory tract; dizziness, headache, nausea; chemical pneumonitis (from aspiration of liquid); dry, red skin; irritant contact dermatitis; eye redness, pain.	Eyes, skin, kidneys	Clear yellow brown combustible liquid; floats on water; distinct diesel petroleum hydrocarbon odor. BP: 356-716°F Fl.P: 154.4-165.2°F LEL: 0.6% UEL: 7.0%
Ethylbenzene	100-41-4	TWA 20 ppm	TWA 100 ppm (435 mg/m^3) STEL 125 ppm (545 mg/m^3)	TWA 100 ppm (435 mg/m^3)	800 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with an aromatic odor. BP: 277°F Fl.P: 55°F UEL: 6.7% LEL: 0.8% Class IB Flammable Liquid
Fluoranthene	206-44-0	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible burns; heart and liver injury, pulmonary edema, respiratory arrest, gastrointestinal disturbances.	Heart, liver, lungs.	Yellow needles.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at MHANY Chestnut Commons, Brooklyn, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Fuel Oil #2	68476-30-2	TWA 100 mg/m3; Skin notation	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; CNS effects; nausea, vomiting, headache, cramping, dizziness, weakness, loss of coordination,, drowsiness; kidney, liver damage	Eyes, skin, CNS	Clear or yellow to red oily liquid, kerosene-like odor BP: 347 - 689 °F UEL:5-6% LEL: 0.7-1.0%
Gasoline	8006-61-9	TWA 300 ppm STEL 500 ppm	Carcinogen	None established	Ca [IDLH value has not been determined]	Skin absorption; inhalation; ingestion; skin and/or eye contact	Eyes and skin irritation, mucous membrane; dermatitis; headache; listlessness, blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis; possible liver, kidney damage [Potential occupational carcinogen]	Eyes, skin, respiratory system, CNS, Liver, Kidneys	Clear liquid with a characteristic odor, aromatic Fl.Pt. = -45°F LEL = 1.4% UEL = 7.6% Class 1B Flammable Liquid
Hydrogen Sulfide	7783-06-4	TWA 1 ppm STEL 5 ppm	C 10 ppm (15 mg/m^3) [10-minute]	C 20 ppm 50 ppm [10-minute maximum peak]	100 ppm	inhalation, skin and/or eye contact	Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite	Eyes, respiratory system, central nervous system	Colorless gas with a strong odor of rotten eggs. BP: -77°F UEL: 44.0% LEL: 4.0% Flammable Gas
Indeno[1,2,3-cd]pyrene	193-39-5	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible human carcinogen (skin); weakness; affect liver, lung tissue, renal tissue; impairment of blood forming tissue	Skin	Fluorescent green-yellow crystalline solid BP: 536 C
Lead (inorganic)	7439-92-1	TWA 0.05 mg/m^3	TWA (8-hour) 0.050 mg/m^3	TWA 0.050 mg/m^3	100 mg/m^3 (as Pb)	inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid. BP: 3164°F Noncombustible Solid in bulk form
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	TWA 0.01 mg/m^3 STEL 0.03 mg/m^3 [skin]	TWA 0.01 mg/m^3 STEL 0.03 mg/m^3 [skin]	TWA 0.01 mg/m^3 C 0.04 mg/m^3	2 mg/m^3 (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spasticity, jerking limbs; dizziness; salivation; lacrimation (discharge of tears); nausea, vomiting, diarrhea, constipation; skin burns; emotional disturbance; kidney injury; possible teratogenic effects	Eyes, skin, central nervous system, peripheral nervous system, kidneys	Appearance and odor vary depending upon the specific (organo) alkyl mercury compound
Mercury compounds [except (organo) alkyls] (as Hg) Mercury	7439-97-6	TWA 0.025 mg/m^3 (elemental and inorganic forms)	Hg Vapor: TWA 0.05 mg/m^3 [skin] Other: C 0.1 mg/m3 [skin]	TWA 0.1 mg/m^3	10 mg/m^3 (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eyes, skin, respiratory system, central nervous system, kidneys	Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.] BP: 674°F
Methylene Chloride (Dichloromethane)	75-09-2	TWA 50 ppm, A3 - suspected human carcinogen	Ca	TWA 25 ppm STEL 125 ppm	Ca [2300 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]	Eyes, skin, cardiovascular system, central nervous system	Colorless liquid with a chloroform-like odor BP: 104°F UEL: 23% LEL: 13%
Naphtha (Rubber Solvent)	8030-30-6	None established	TWA 100 ppm (400 mg/m^3)	TWA 100 ppm (400 mg/m^3)	1000 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; dizziness, drowsiness; dermatitis; in animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Reddish-brown, mobile liquid with an aromatic odor BP: 320-428°F Fl.P: 100-109°F Class II Combustible Liquid
Naphthalene	91-20-3	TWA 10 ppm [skin]	TWA 10 ppm (50 mg/m^3) STEL 15 ppm (75 mg/m^3)	TWA 10 ppm (50 mg/m^3)	250 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	Colorless to brown solid with an odor of mothballs. BP: 424°F Fl.P: 174°F UEL: 5.9% LEL: 0.9%
Petroleum hydrocarbons(Petroleum distillates)	8002-05-9	None established	TWA 350 mg/m^3 C 1800 mg/m^3 [15 min]	TWA 500 ppm (2000 mg/m^3)	1,100 [10% LEL]	Inhalation; ingestion; skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, drowsiness, headache, nausea; dried/cracked skin; chemical pneumonitis	CNS, eyes, respiratory system, skin	Colorless liquid with a gasoline or kerosene-like odor BP: 86-460°F Fl. Pt = -40 to -86°F UEL: 5.9% LEL: 1.1% Flammable liquid
Polychlorinated Biphenyls (PCBs) (Chlorodiphenyl (42% Chlorine))	53469-21-9	TWA 1 mg/m^3	Ca TWA 0.001 mg/m^3	0.5 mg/m^3	5 ppm	Dermal; inhalation; ingestion; skin and/or eye contact	Irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Eyes, skin, liver, respiratory system	Colorless to light-colored, viscous liquid, hydrocarbon odor, BP: 617 - 734°F, non-flammable, LEL: NA, UEL: NA
Selenium	7782-49-2	TWA 0.2 mg/m^3	TWA 0.2 mg/m^3	TWA 0.2 mg/m^3	1 mg/m^3 (as Se)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.] BP: 1265°F

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at MHANY Chestnut Commons, Brooklyn, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Silver	7440-22-4 (metal)	TWA 0.1 mg/m^3 (metal, dust, fume) TWA 0.01 mg/m^3 (Soluble compounds, as Ag)	TWA 0.01 mg/m^3	TWA 0.01 mg/m^3	10 mg/m^3 (as Ag)	inhalation, ingestion, skin and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Nasal septum, skin, eyes	Metal: White, lustrous solid BP: 3632°F
Tetrachloroethene	127-18-4	TWA 25 ppm STEL 100 ppm listed as A3, animal carcinogen	Ca Minimize workplace exposure concentrations	TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm	Ca [150 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a mild, chloroform-like odor. BP: 250°F Noncombustible Liquid
Toluene	108-88-3	TWA 20 ppm	TWA 100 ppm (375 mg/m^3) STEL 150 ppm (560 mg/m^3)	TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)	500 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, pungent, benzene-like odor. BP: 232°F Fl.P: 40°F UEL: 7.1% LEL: 1.1% Class IB Flammable Liquid
1,1,1-Trichloroethane (Methyl Chloroform)	71-55-6	TWA 350 ppm STEL 450 ppm	C 350 ppm (1900 mg/m^3) [15-minute]	TWA 350 ppm (1900 mg/m^3)	700 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eyes, skin, central nervous system, cardiovascular system, liver	Colorless liquid with a mild, chloroform-like odor. BP: 165°F UEL: 12.5% LEL: 7.5%
Trichloroethene	79-01-6	TWA 10 ppm STEL 25 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)	Ca [1000 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	Colorless liquid (unless dyed blue) with a chloroform-like odor. BP: 189°F UEL(77°F): 10.5% LEL(77°F): 8%
Vinyl Chloride	75-01-4	TWA 1 ppm	Carcinogen	TWA 1 ppm C 5 ppm [15-minute]	Ca [IDLH value has not been determined]	inhalation, skin, and/or eye contact (liquid)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. BP: 7°F UEL: 33.0% LEL: 3.6% Flammable Gas
Xylene (m, o & p isomers)	108-38-3, 95-47-6, 106-42-3	TWA 100 ppm STEL 150 ppm	TWA 100 ppm (435 mg/m^3)	TWA 100 ppm (435 mg/m^3)	900 ppm	Skin absorption, inhalation, ingestion, skin, and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 282°F, 292°F, 281°F Fl. Pt. 82°F, 90°F, 81°F LEL: 1.1%, 0.9%, 1.1% UEL: 7.0%, 6.7%, 7.0% Class C Flammable Liquid
Zinc Oxide	1314-13-2	TWA 2 mg/m3 STEL 10 mg/m^3	None established	TWA 10 mg/m3 (for zinc oxide fume)	None established	skin and/or eye contact, inhalation, ingestion	Irritation eyes, skin, respiratory tract; gastrointestinal disturbances	Eyes, skin, respiratory system,	Bluish gray solid BP: 1664.6°F Flammable

References

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2017 TLVs® and BEIs®, American Conference of Industrial Hygienists

Abbreviations:

ACGIH – American Conference of Governmental Industrial Hygienists.
BP – boiling point at 1 atmosphere, °F
C – Ceiling, is a concentration that should not be exceeded during and part of the working exposure.
CAS# - Chemical Abstracts Service registry number which is unique for each chemical.
Ft Pt. – Flash point
IDLH - Immediately Dangerous to Life and Health concentrations represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
LEL – Lower explosive (flammable) limit in air, % by volume (at room temperature)
mg/m^3 – Milligrams of substance per cubic meter of air
NIOSH - National Institute for Occupational Safety and Health.
OSHA – Occupational Safety and Health Administration
PEL - OSHA Permissible Exposure Limit (usually) a time weighted average concentration that must not be exceeded during any 8 hour work shift of a 40 hr work week.
ppm – parts per million
REL – NIOSH Recommended Limit indicated a time weighted average concentration that must not be exceeded during any 10 hour work shift of a 40 hr work week
SG - Specific Gravity
STEL – Short-term exposure limit (ST)
TLV - ACGIH Threshold Limit Values (usually 8 hour time weighted average concentrations).
TWA – 8-hour, time-weighted average
UEL – Upper explosive (flammable) limit in air, % by volume (at room temperature)
VP - Vapor Pressure

FIGURES

1. Site Location Map
2. Site Plan with Emergency Muster Area
3. Routes to Urgent Care and Hospital

QUADRANGLE LOCATION

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

N

0 2000'

Title:

SITE LOCATION MAP

BLOCK 2203 LOT 21
408 WEST 207TH STREET NEW YORK, NEW YORK

Prepared for:

!HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: V.S.	Date: 07JUN19	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	1
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y107.01.CDR		

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N

LEGEND

EMERGENCY MUSTER AREA

SITE BOUNDARY

75 0 75'

Title:

SITE PLAN WITH EMERGENCY MUSTER AREA

BLOCK 2203 LOT 21
408WEST 207TH STREET
NEW YORK. NEW YORK

Prepared for:

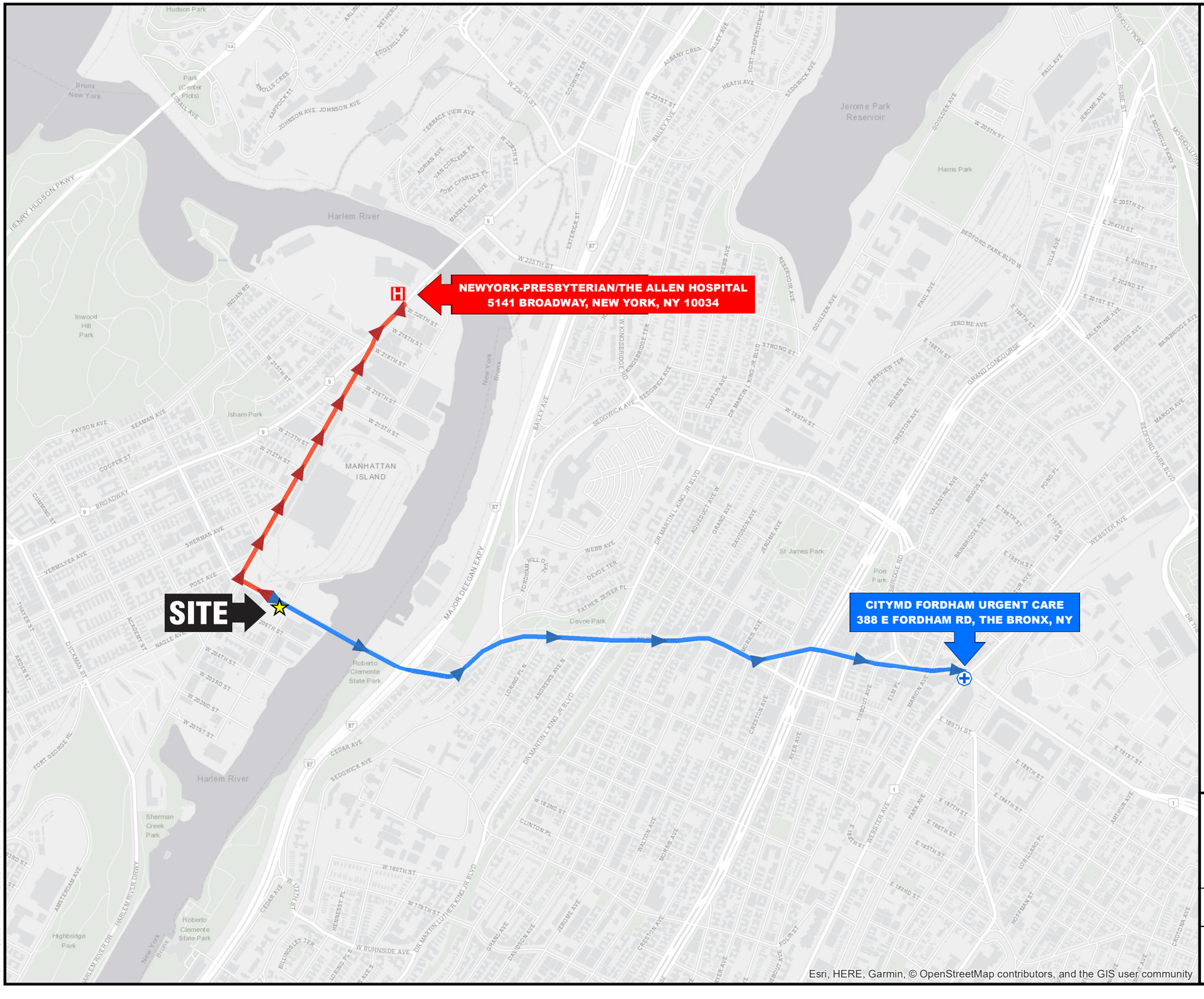
HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: V.S.	Date: 05/07/21
Prepared by: M.S.R.	Scale: AS SHOWN
Project Mgr: V.S.	Project: 2477.0008Y000
File: 2477.0008Y107.2R2.mxd	

FIGURE 2

V:\GIS\PROJECTS\2477Y\0008Y\107\2477.0008Y107.2R2.MXD



DIRECTIONS TO HOSPITAL

1. HEAD NORTHWEST ON WEST 207TH STREET TOWARD 10TH AVE
2. TURN RIGHT ONTO 10TH AVENUE
3. MERGE ONTO BROADWAY
4. TURN LEFT ONTO W 220TH STREET
5. TURN LEFT
6. MOUNT SINAI HOSPITAL WILL BE ON THE LEFT

DIRECTIONS TO CITYMD

1. HEAD SOUTHEAST ON W 207TH STREET TOWARD 9TH AVENUE
2. CONTINUE ONTO UNIVERSITY HEIGHTS BRIDGE
3. CONTINUE ONTO W FORDHAM ROAD
4. CITY MD WILL BE ON THE RIGHT

1,000 0 1,000'

Title:

EMERGENCY ROUTE MAP

BLOCK 2203 LOT 21
408 WEST 207TH STREET
NEW YORK. NEW YORK

Prepared for:

!HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: V.S.	Date: 06/07/19	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	3
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y107.2.mxd		

V:\GIS\PROJECTS\2477Y\0008Y\107\2477.0008Y107.2.MXD

APPENDICES

A. Job Safety Analysis (JSA) Forms
B. SDSs for Chemicals Used
C. COVID-19 Interim Health and Safety Guidance
D. Personal Protective Equipment (PPE) Management Program
E. Subsurface Utility Clearance Management Program
F. Heavy Equipment Exclusion Zone Policy
G. Generic Community Air Monitoring Plan (CAMP)

APPENDIX A

Job Safety Analysis (JSA) Forms

JOB SAFETY ANALYSIS	Cntrl. No.	DATE:	☒ NEW ☐ REVISED	PAGE 1 of 2
JSA TYPE CATEGORY **GENERIC**	WORK TYPE	WORK ACTIVITY (Description)		

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☐ GLOVES:
☐ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☐ PPE CLOTHING:	
☐ SAFETY GLASSES	☐ SAFETY SHOES		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment:

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE: A _ foot exclusion zone will be maintained around (indicate equipment).

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. [INSERT JOB STEP]	**1a. CONTACT:** [INSERT HAZARD]	1a.
	1b. CAUGHT: [INSERT HAZARD]	1b.
	1c. FALL: [INSERT HAZARD]	1c.
	1d. EXPOSURE: [INSERT HAZARD]	1d.
	1e. EXERTION: [INSERT HAZARD]	1e.
	1f. ENERGY SOURCE: [INSERT HAZARD]	1f.
2. [INSERT JOB STEP]	**2a. CONTACT:** [INSERT HAZARD]	2a.
	2b. CAUGHT: [INSERT HAZARD]	2b.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

	2c. FALL: [INSERT HAZARD]	2c.
	2d. EXPOSURE: [INSERT HAZARD]	2d.
	2e. EXERTION: [INSERT HAZARD]	2e.
	2f. ENERGY SOURCE: [INSERT HAZARD]	2f.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-011	DATE: 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Construction - Excavation**	**Excavation / Trenching**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Senior Engineer	Brian Hobbs	Corporate Health & Safety Manager
Ian Holst	Senior Engineer		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather or cut resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☒ LONG SLEEVED SHIRT	☒ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility long sleeved clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-toe boots		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Jackhammer, Excavator, Backhoe, Hand Tools, Photoionization Detector, barrels, 42" traffic cones, snow fencing, telescoping poles, temporary chain link fence, ladders, shovels, digging bars, power tools (cut-off saw), Two-way radios, Sheeting, Trench box, Retractable lanyard, Harness

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around equipment in motion and outside the swing/tip radius.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Pre-Clearance Protocol.	**1a. CONTACT:** Damage to underground utility.	1a. Confirm that (if applicable) "Call Before You Dig" and local utility companies were contacted prior to trenching in order to confirm utility mark outs. Must have a case # before digging.
	1b. ENERGY SOURCE/CONTACT: Property damage; Pressurized water mains may cause lacerations or broken bones. Pressurized gas mains may explode causing serious injury, or death. Underground electric may cause severe burns, shock, or death.	1b. Pre-clearing of the trenching location must be conducted to a minimum of 5 vertical feet below the ground surface (10 feet minimum for Critical Zone) using hand tools (shovel and non-metallic dig bar) prior to trenching. Supervisor should be contacted to discuss appropriate pre-clearing depth. Complete subsurface clearance checklist.
	1c. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	1c. Be aware of the conditions when walking or loading equipment and working. Walk within established pathway avoiding uneven surfaces. Remove potential slip/trip/fall hazards.
2. Set up work zone.	**2a. CONTACT/CAUGHT:** Cuts/lacerations from equipment. Broken bones from contact by vehicle.	2a. Isolate work area from hazards with cones, barricades, and snow fencing, telescoping poles or temporary chain link fence. Utilize a flag person when necessary (i.e., third party traffic in area). Install traffic signs in roadways and for detours. Spotters will maintain and enforce exclusion zone.
	2b. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	2b. See 1c.

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[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards, energy source; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Trenching Activity.	**3a. CONTACT:** Serious injury including broken bones, muscle strains or tears, and possibly death due to contact with machine.	3a. Spotter(s) required for all heavy equipment operation. No worker shall be allowed inside the exclusion zone or along the trench/excavation area while any equipment is in operation. A minimum exclusion zone greater than the length of the equipment boom must be established. Workers only allowed in exclusion zone if the operator is in "Hands Off "mode. Operator will not operate equipment until worker is out of exclusion zone. Spotters and operators will have radios for communication, when either loses sight of one another, and/or in case of emergency.
	3b. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones	3b. Any trench/excavation deeper than 3' must have a ladder within 25' of any worker in the excavation. At least 3'(rungs) of the ladder shall be above the top of the excavation. All spoil piles shall be maintained 2' minimum from edge of excavation. 3b. Any trench/excavation deeper than 6' must have fall protection, retractable lanyard for ladder use, and 42" high guardrails along the edge of the trench/excavation.
	3c. EXPOSURE: Noise, Dust, Concrete- Asphalt, petroleum hydrocarbon vapors may cause damage to ears and lungs	3c. Air monitoring using a calibrated photoionization detector (PID) will be used to monitor the breathing zone of the work area. If a reading of >5ppm is recorded, the oversight personnel must temporarily cease work and instruct all Site personnel to step away from the area of elevated readings.
4. Setting Trench protections if necessary.	**4a. CAUGHT:** Injury due to contact with failed trench, may include muscle strains or tears, abrasions or lacerations, broken bones and possibly death.	4a. To prevent cave-ins and avoid caught by/between, excavations over 4' in depth, unless working in stable rock, shall have engineer approved shoring, sheeting or trench box. Top of protection shall be at least 2' above top of excavation.
	4b. CONTACT/CAUGHT: Injury due to rigging activities and entering exclusion zone during lifting and/or transport of shoring/trench box/material may include muscle strains or tears, abrasions or lacerations, broken bones and possibly death.	4b. Use only inspected rigging with 2, 3 or 4 lift points; wear cut-resistant gloves. Rigging to be hooked up to factory installed hook up points on equipment. Control load with non-conductive tag lines with workers out of exclusion zone. Don't stand underneath suspended load; wear steel toed boots and hard hat.
	4c. FALL: Possible injury due to fall into excavation may include muscle strains or tears, abrasions or lacerations, or broken bones.	4c. Shoring to be set and sides will be backfilled to avoid fall hazards before workers are allowed to enter area. Operator will be in "HANDS OFF" mode before workers enter work area to unhook rigging. An inspected ladder extending 3' above top of the shoring will be used to enter and exit the shoring. Workers will use three points of contact when using the ladder.
5. Secure/Leave Site. If backfilling, see excavation backfilling and compaction JSA for potential hazards and critical actions.	**5a. FALL:** Potential Slip, Trip or Fall - may cause muscle strains or tears, abrasions or lacerations, or broken bones.	5a. See 1c. 5a. All open excavations must be backfilled or secured prior to departure with steel plates, orange construction fence or temporary chain link fencing.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-019	DATE: 8/6/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Recon**	**Site Walk and Inspection**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Sara Barrientos	Staff Geologist	Brian Hobbs	Corporate Health and Safety Manager
		Joe Duminuco	Vice President

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: ear plugs as necessary ☒ SAFETY SHOES: Steel or composite toed	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High-visibility vest or high-vis outerwear	☒ GLOVES: Leather/cut-resistant/chemical resistant ☒ OTHER: Tyvek and rubber boots as necessary, dust mask as necessary

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Site map, emergency contact list, documentation of urgent care/hospital routes and / or guide familiar with Site, operating cell phone or walkie-talkie if Site allows.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE (EZ): A minimum 10' exclusion zone will be maintained around equipment.

SITE SECURITY: Prior to site inspection verify appropriate method to address Site Security concerns as it relates to potential criminal activity, homeless population, and/or isolation concerns. Work with the Project Principal and/or Project Manager to address appropriately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site contact.	**1a. CONTACT/EXPOSURE/FALL:** Personal injury caused by lack of site specific hazards.	1a. Inquire about hazards and other activities taking place at the Site. 1a. Inform Site contact of work scope, timeline and location(s). 1a. Discuss emergency evacuation procedures and muster points with Site contact.
2. Traversing the Site	**2a. CONTACT:** Property damage and personal injury caused by obstructions/vehicles or unauthorized personnel at remote Sites.	2a. All equipment must be stowed and secured prior to moving. 2a. Maintain speed limit as posted on-site. 2a. When possible drive on established roadways. 2a. Yield to all pedestrians. 2a. Use pull-through spots or back into parking spots. 2a. Don high visibility clothing/safety vest. If working at remote Site, add orange accessories during hunting season.
	2b. FALL: Uneven terrain and weather conditions. Overgrown shrubs and vines. Equipment in the work zone.	2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2b. When possible, use established pathways and walk on stable, secure ground. 2b. Communicate traversing hazards with others.
	2c. OVEREXERTION: Muscle strain while carrying equipment.	2c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use mechanical assistance or make multiple trips to carry equipment.
	2d. EXPOSURE: Biological hazards – ticks; bees/wasps; poison ivy; insects; (Ticks are most active any time the temperature is above freezing, typically from March to November.)	2d. Inspect area to avoid contact with biological hazards. 2d. Ticks: • Treat outer clothing including pants, shirts, socks, boots and hats the evening before with Permethrin (allowing at least two hours before use). • Apply DEET to exposed skin before travelling to the Site and reapply after two hours. • Check for ticks during and after work. 2d. Bees: • Use bee spray as appropriate to deter/eliminate bees. • Protect exposed skin with insect repellent. 2d. Poison Ivy:

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[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

	2e. EXPOSURE: Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	• Identify areas of poison ivy and spray with weed killer. Don Tyvek and rubber boots while traversing poison ivy areas. • If skin contacts poison ivy, wash skin thoroughly with soap and water. 2e. Wear sunscreen with SPF 15 or greater on exposed skin whenever 30 minutes or more of sun exposure is expected. 2e. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 2e. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 2e. Wear appropriate rain gear as needed. 2e. Take frequent breaks if tired, wet, or cold/hot. Drink water. 2e. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
3. Walking near heavy equipment and machinery.	**3a. CONTACT:** Personal injury from Site and roadway traffic. Personal injury from flying debris **3b. OVEREXERTION:** Personal injury from lifting/moving/rotating equipment. **3c. EXPOSURE:** Hearing damage from noise generating equipment/processes. Inhalation/exposure to hazardous vapors and or dust. **3d. EXPOSURE:** Working in a remote area.	3a. See 2a. 3a. Maintain an exclusion zone of at least 10'-25' feet from all engaged equipment. 3a. Keep body parts out of the line of fire of pinch points. 3a. Wear appropriate PPE always. 3b. See 2c. 3c. Wear hearing protection if >85 dBA. (i.e. noise levels which require you to raise your voice to communicate) 3c. Always wear leather gloves when handling any tools or equipment. 3c. Always wear appropriate PPE based off chemicals present. 3d. Use the "buddy system" whenever possible. If working alone, contact PM upon arrival/departure, as well as during work activities prior to commencing work if applicable. 3d. Always carry a communication (i.e., cell phone, walkie-talkie) or directional (i.e., map, compass, etc.) device when traversing remote areas.
4. Working in adverse weather conditions.	**4a. EXPOSURE:** Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	4a. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 4a. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 4a. Wear appropriate rain gear as needed. 4a. Take frequent breaks if tired, wet, or cold/hot. Drink water. 4a. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
5. Departing Site.	**5a. EXPOSURE:** Exposure to unnecessary hazards should personnel believe Roux is on-Site during an emergency and conduct a search.	5a. Sign out or notify Site contact and Roux Project Manager of your departure.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-019	DATE: 8/6/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Recon**	**Site Walk and Inspection**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Sara Barrientos	Staff Geologist	Brian Hobbs	Corporate Health and Safety Manager
		Joe Duminuco	Vice President

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: ear plugs as necessary ☒ SAFETY SHOES: Steel or composite toed	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High-visibility vest or high-vis outerwear	☒ GLOVES: Leather/cut-resistant/chemical resistant ☒ OTHER: Tyvek and rubber boots as necessary, dust mask as necessary

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Site map, emergency contact list, documentation of urgent care/hospital routes and / or guide familiar with Site, operating cell phone or walkie-talkie if Site allows.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE (EZ): A minimum 10' exclusion zone will be maintained around equipment.

SITE SECURITY: Prior to site inspection verify appropriate method to address Site Security concerns as it relates to potential criminal activity, homeless population, and/or isolation concerns. Work with the Project Principal and/or Project Manager to address appropriately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site contact.	**1a. CONTACT/EXPOSURE/FALL:** Personal injury caused by lack of site specific hazards.	1a. Inquire about hazards and other activities taking place at the Site. 1a. Inform Site contact of work scope, timeline and location(s). 1a. Discuss emergency evacuation procedures and muster points with Site contact.
2. Traversing the Site	**2a. CONTACT:** Property damage and personal injury caused by obstructions/vehicles or unauthorized personnel at remote Sites.	2a. All equipment must be stowed and secured prior to moving. 2a. Maintain speed limit as posted on-site. 2a. When possible drive on established roadways. 2a. Yield to all pedestrians. 2a. Use pull-through spots or back into parking spots. 2a. Don high visibility clothing/safety vest. If working at remote Site, add orange accessories during hunting season.
	2b. FALL: Uneven terrain and weather conditions. Overgrown shrubs and vines. Equipment in the work zone.	2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2b. When possible, use established pathways and walk on stable, secure ground. 2b. Communicate traversing hazards with others.
	2c. OVEREXERTION: Muscle strain while carrying equipment.	2c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use mechanical assistance or make multiple trips to carry equipment.
	2d. EXPOSURE: Biological hazards – ticks; bees/wasps; poison ivy; insects; (Ticks are most active any time the temperature is above freezing, typically from March to November.)	2d. Inspect area to avoid contact with biological hazards. 2d. Ticks: • Treat outer clothing including pants, shirts, socks, boots and hats the evening before with Permethrin (allowing at least two hours before use). • Apply DEET to exposed skin before travelling to the Site and reapply after two hours. • Check for ticks during and after work. 2d. Bees: • Use bee spray as appropriate to deter/eliminate bees. • Protect exposed skin with insect repellent. 2d. Poison Ivy:

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

	2e. EXPOSURE: Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	• Identify areas of poison ivy and spray with weed killer. Don Tyvek and rubber boots while traversing poison ivy areas. • If skin contacts poison ivy, wash skin thoroughly with soap and water. 2e. Wear sunscreen with SPF 15 or greater on exposed skin whenever 30 minutes or more of sun exposure is expected. 2e. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 2e. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 2e. Wear appropriate rain gear as needed. 2e. Take frequent breaks if tired, wet, or cold/hot. Drink water. 2e. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
3. Walking near heavy equipment and machinery.	**3a. CONTACT:** Personal injury from Site and roadway traffic. Personal injury from flying debris **3b. OVEREXERTION:** Personal injury from lifting/moving/rotating equipment. **3c. EXPOSURE:** Hearing damage from noise generating equipment/processes. Inhalation/exposure to hazardous vapors and or dust. **3d. EXPOSURE:** Working in a remote area.	3a. See 2a. 3a. Maintain an exclusion zone of at least 10'-25' feet from all engaged equipment. 3a. Keep body parts out of the line of fire of pinch points. 3a. Wear appropriate PPE always. 3b. See 2c. 3c. Wear hearing protection if >85 dBA. (i.e. noise levels which require you to raise your voice to communicate) 3c. Always wear leather gloves when handling any tools or equipment. 3c. Always wear appropriate PPE based off chemicals present. 3d. Use the "buddy system" whenever possible. If working alone, contact PM upon arrival/departure, as well as during work activities prior to commencing work if applicable. 3d. Always carry a communication (i.e., cell phone, walkie-talkie) or directional (i.e., map, compass, etc.) device when traversing remote areas.
4. Working in adverse weather conditions.	**4a. EXPOSURE:** Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	4a. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 4a. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 4a. Wear appropriate rain gear as needed. 4a. Take frequent breaks if tired, wet, or cold/hot. Drink water. 4a. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
5. Departing Site.	**5a. EXPOSURE:** Exposure to unnecessary hazards should personnel believe Roux is on-Site during an emergency and conduct a search.	5a. Sign out or notify Site contact and Roux Project Manager of your departure.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-009	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 1

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**O&M**	**Movement of 55-Gallon Drums/Drum Handling with Mobile Carrier**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Michael Sarni	Technician	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant gloves
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER:
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent long sleeve shirt or long sleeve shirt and reflective safety vest.	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel or composite toe		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Mobile Drum Carrier, safety cones, and caution tape

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around heavy equipment (i.e. forklift).

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Preparing for and Inspection of Drum	**1a. FALL:** Tripping/falling due to uneven surface. Loose debris/garbage in work area.	1a. Clear area of loose garbage and debris. Inspect 55-gal drums for proper condition, labeling, check drum ring and bolts for tightness, inspect mobile drum carrier. 1a. Do a Test Lift to get a general sense of the weight of the drum. 1a. Inspect and use established pathways to avoid uneven terrain, weather-related hazards (i.e., debris, puddles, ice, etc.), and other obstructions. 1a. Secure work area and coordinate and communicate the planned work activities with other personnel working in the area. 1a. Delineate work area with 42" safety cones.
	1b. CONTACT/EXPOSURE: Drums could potentially be damaged or contain hazardous material. Mobile drum carrier could potentially be in poor working condition causing malfunctioning during operation.	1b. Prior to inspecting drums don cut-resistant gloves. If drum is not properly labeled, do not open and cease all drum transport activities. Immediately contact project manager and inform him/her of drum situation. 1b. Do not continue drum transport activities until further actions are determined by the project manager. 1b. If the drum is properly labeled, but leaking, improperly sealed or in poor condition, place drum in an over-pack drum. 1b. Inspect mobile drum carrier to ensure its overall integrity. Look for rust marks or potential weak points where the drum carrier could malfunction. Inspect the wheels to ensure that they easily turn and nothing is impeding their movement.
	1c. EXERTION/CAUGHT: Potential pinching/exertion hazards while securing ring/ tightening bolts	1c. Keep back straight and knees slightly bent while securing drum ring/tightening bolt. Wear cut-resistant gloves.
2. Position drum clamp tightly in between drum ribs, securing drum clamp to drum with chain	**2a. CAUGHT:** Pinching fingers between drum clamp and handle/chain.	2a. Attach drum clamp with chain and tighten until snug. Do not place hands between drum clamp and drum as the chain is tightened; wear cut resistant gloves. Keep face away from drum when handling in case of escaping vapors.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Disengage safety latches on handle, pull handle down until drum is lifted off ground and safety latches are reengaged; slightly suspending drum off the ground	**3a. EXERTION/ CONTACT:** Potential muscle strain associated with lifting/engaging drum/handle. Drum could shift/slip downward and crush toes.	3a. Ascertain whether the drum is overweight; if it is, then two people are needed to lower handle while drum is secured with clamp so that safety latches can be engaged. Keep body out of the line of fire of the handle (do not position head above handle) as it is being pushed down. Do not allow feet/toes to be positioned under the drum as it is being lifted; wear steel/composite toe boots.
	3b. CAUGHT: Fingers could be pinched while engaging/disengaging safety latches on handle	3b. Wear cut-resistant gloves while disengaging/reengaging safety latches. 3b. Avoid placing hands in pinch points.
4. Transport drums to designated location and disengage drum clamp (repeat Step 3 in reverse order)	**4a. FALL:** Tripping/ falling due to obstructions and uneven terrain. Potential for drum to fall during transport.	4a. Ensure transport path is free of potential obstructions that may cause the drum/carrier to become unstable. Position drum clamp between the ribs on the drum to prevent possible slipping.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-015	DATE: 1/4/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Recon**	**Mobilization/Demobilization**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Rebecca Lowy	Staff Assistant Geologist	Brian Hobbs	Senior Health & Safety Manager
Tally Sodre	OHSM	Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION (as needed) ☒ SAFETY SHOES: Steel Toe or composite toe	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest of high-visibility clothing; long sleeve shirt; long pants	☒ GLOVES: Leather, nitrile, and cut resistant (as needed) ☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: None

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around equipment in use..

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilize/demobilize and establish work area	**1a. FALL:** Slip/trips/falls from obstructions, uneven terrain, weather conditions, heavy loads, and/or poor housekeeping.	1a. Use 3 points-of-contact/ensure secure footing when entering and exiting vehicle. 1a. Inspect walking path for uneven terrain, steep hills, obstructions, and/or weather-related hazards (i.e., ice, snow, and puddles) prior to mobilizing equipment. Use established pathways. Walk on stable/secure ground. 1a. Do not climb over stored materials/equipment; walk around. Practice good housekeeping; organize and store equipment neatly in one area at its lowest potential energy. 1a. Wear boots with adequate treads. 1a. Delineate unsafe areas with 42” cones, caution tape and/or flagging.
	1b. CONTACT: Personal injury and/or property damage caused by being struck by Site traffic or equipment used in Site activities.	1b. Observe and maintain the posted speed limits. 1b. When first arriving onsite, park vehicles in designated parking space and/or out of the way locations. Use parking brake on all vehicles and tire chocks on work trucks and trailers. 1b. Check in with Site Manager/Supervisor to ensure coordination with other Site activities and to discuss any special hazards. Ensure that short-service employees (SSE) are identified. 1b. Identify potential traffic sources. 1b. Wear PPE including high visibility clothing or reflective vest. 1b. Use a spotter while moving work vehicles; plan ahead to avoid backing whenever possible. 1b. Maintain a minimum 10’ exclusion zone when vehicles are in motion. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver-to-spotter visibility. 1b. Delineate work area with 42” cones, flags, caution tape, and/or other barriers. 1b. Position “Work Area” signs at Site entrances, if possible, or at either side of work area.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
		1b. Position largest vehicle to protect against oncoming traffic. 1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route. 1b. Observe potential overhead and ground surface features that may interfere with moving equipment. Clear the path of physical hazards prior to initiating mobilization.
	1c. CAUGHT: Personal injury from pinch points and being in line-of-fire of vehicle and/or equipment.	1c. Make sure driver has engaged parking brake and placed wheel chocks in a position to prevent movement. Be sure that vehicle is parked in front/down gradient (positioned to best block oncoming traffic) of work area. 1c. Wear leather gloves when handling any tools or equipment. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects/cutting tools/glass. 1c. Keep body parts away from line-of-fire of equipment. 1c. Always carry tools by the handles and/or designated carrier. Ensure sharp-edged tools are sheathed/secure. 1c. Remove any loose jewelry. Avoid wearing loose clothing and/or ensure loose clothing is secure. 1c. Secure all items on the equipment, tighten up any items or features that have potential to shift or break during mobilization.
	1d. OVEREXERTION: Muscle strains while lifting/carrying equipment.	1d. Use body positioning and lifting techniques that avoid muscle strain; keep back straight, lift with legs, turn with whole body, keep load close to body, and never reach with a load. 1d. Ensure that loads are balanced. Use assistance (mechanical or additional person) to carry equipment that is either unwieldy or over 50 lbs.
	1e. EXPOSURE: Personal injury from exposure to biological and environmental hazards.	1e. Inspect area to avoid contact with biological hazards (i.e. poisonous plants, stinging insects, ticks, etc.). 1e. Wear long sleeved clothes treated with Permethrin, apply insect repellant containing DEET to exposed skin, and inspect clothes and skin for ticks during and after work. 1e. Apply sunscreen (SPF 15+) if exposure to sun for 30 minutes or more is expected.
	1f. EXPOSURE: Weather related injuries.	1f. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, nausea, rapid and shallow breathing). Take breaks in cool places and hydrate as needed. 1f. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks in warm areas as needed. 1f. Wear clothing appropriate for weather and temperature conditions (e.g., rain jackets, snow pants, multiple layers). 1f. If lightning is observed, wait 30 minutes in a sheltered location (car is acceptable) before resuming work.
	1g. EXPOSURE: Personal injury from noise hazards.	1g. Wear hearing protection if sound levels exceed 85 dBA (if you must raise your voice for normal conversation).

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JOB SAFETYANALYSIS Ctrl. No. GEN-020	DATE: 1/4/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY: **GENERIC**	WORK TYPE: **Gauging & Sampling**	WORK ACTIVITY (Description): **Soil Sampling**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
MaryBeth Lyons	Project Scientist	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health and Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES ☒ FLAME RESISTANT CLOTHING (as needed)	☐ GOGGLES ☐ FACE SHIELD: ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Recommended Equipment: 42" traffic cones, caution tape, trowel

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around moving equipment, if present.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure location	**1a. CONTACT:** Personnel and vehicular traffic may enter the work area.	1a. If in an area with foot or vehicle traffic, delineate the work area with 42" traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity. 1a. Wear reflective vest and/or high visibility clothing. 1a. Face the direction of any vehicular traffic. Position vehicle to protect worker from traffic. 1a. Communicate work activity with adjacent work areas.
	1b. FALL: Tripping/falling due to uneven terrain or entry/exit from excavations.	1b. Inspect pathways and work area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions. 1b. Use established pathways and walk on stable, secure ground. 1b. Stage equipment and tools in a convenient, stable, and orderly manner. Store equipment at lowest potential energy. 1b. Roux employees should stay 5 feet from in-progress excavations and trenches. Should entry to an excavation be required (when stabilization is complete), ladders must be employed for steep embankments, excavations, pits, and trenches.
	1c. EXPOSURE: Exposure to sun and excessive heat, possibly causing sunburn, heat exhaustion or heat stroke. Exposure to cold temperatures possibly causing cold stress. Skin burn as a result of fire, if applicable. Exposure to explosive vapors due to tank farm operations. Exposure to airborne dust due to high wind speeds. Biological hazards - ticks, bees/wasps, poison ivy, thorns, insects, etc.	1c. Wear sunscreen with an SPF 15 or greater whenever 30 minutes or more of exposure is expected. 1c. Use a tent to shade the work area from direct sunlight particularly when warm temperatures are expected. 1c. Be aware of the location of all Site personnel. 1c. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). 1c. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). 1c. Take breaks for rest and water as necessary. Move to an area that is well shaded or a climate controlled area (i.e., car, site trailer, etc.). 1c. No open flames/heat sources. 1c. Flame retardant clothing must be worn when specified by Site policy. 1c. Cell phones should be disabled when specified by Site policy. 1c. Pre-treat field clothing with Permethrin prior to site visit to kill ticks and insects. 1c. Wear long sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin. 1c. Spray insect repellant containing DEET on exposed skin when working in overgrown areas of the Site. 1c. Inspect area to avoid contact with biological hazards. 1c. Wear cut-resistant gloves when handling branches, shrubs, etc. that may lie within the walking path. 1c. Wear spoggles if the average wind speeds are above 15 mph. 1c. Personnel shall examine themselves and co-worker's outer clothing for ticks periodically when onsite. 1c. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water. If rash persists after washing, immediately notify your supervisor, the OM and OHSM for possible consultation with a physician at an approved Occupational Health Clinic.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Collect Soil Sample	**2a. CONTACT:** Personal injury from pinch points, cuts, and abrasions from sampling equipment tools, and material within soil sample. Personal injury from contact with moving equipment while sampling. Personal injury from contact with glass sample jars.	2a. Wear cut-resistant (i.e., Kevlar) gloves under chemical-resistant (nitrile) disposable gloves when handling soil samples and sampling jars. 2a. Where possible, use trowel or equivalent tool to avoid contact with soil. 2a. If sampling from bucket of heavy equipment, ensure all equipment is off and operator utilizes the “show me your hands” policy. 2a. See 1a.
	2b. EXPOSURE: Exposure to contamination (impacted soil) and/or lab preservatives.	2b. Wear chemical-resistant (nitrile) disposable gloves over cut resistant gloves to protect hands when handling samples; use containment material or plastic sheeting to protect surrounding areas. 2b. Wear safety glasses to protect eyes from dust or air-borne contaminants that may results from disturbing the soil. 2b. Where possible, remain upgradient from sample location if collecting soil sample from stockpile, drill rig, etc. to avoid breathing contaminant vapors, if they are present. 2b. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 2b. Open sample jars slowly and fill carefully to avoid contact with preservatives.
	2c. EXERTION: Exertion due to repetitive motion and ergonomics.	2c. Utilize a table or raised surface for soil sampling if multiple soil samples are going to be taken to minimize repetitive bending motion.
3. Decontaminate equipment	**3a. EXPOSURE/CONTACT:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated vapors and/or soil). **3b. EXPOSURE:** Chemicals in cleaning solution including ammonia.	3a. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3a. Use an absorbent pad to clean spills. 3a. Properly dispose of used materials/PPE in provided drums in designated drum storage area. 3a. Remain upwind of sample and avoid breathing contaminant vapors, if they are present. 3b. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3b. Work on the upwind side of decontamination area. 3b. Use an absorbent pad to clean spills. 3b. Properly dispose of used materials/PPE in provided drums in designated drum storage area. Ensure that all drums are properly labeled and secured.

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APPENDIX B

SDSs for Chemicals Used

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer	Supplier
Alconox, Inc. 30 Glenn Street White Plains, NY 10603 1-914-948-4040	Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

8 Exposure controls/personal protection

8.1 Control parameters :

7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower**: **Explosion limit upper**:	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density**:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or not available.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

Class: None
Label: None
LTD. QTY: None

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.	
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0

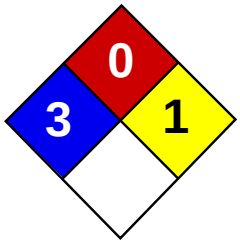
Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

HMIS: 1-0-0



Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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Last Updated: 05/21/2013 12:00 PM

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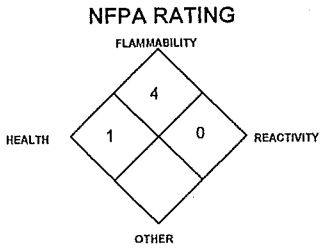
MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards



PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS:	**ISOBUTYLENE - C_4H_8** Document Number: Isobutylene
PRODUCT USE:	For general analytical/synthetic chemical uses.
SUPPLIER/MANUFACTURER'S NAME: ADDRESS:	MESA Specialty Gases & Equipment 3619 Pendleton Avenue, Suite C Santa Ana, CA 92704
BUSINESS PHONE: EMERGENCY PHONE:	1-714-434-7102 INFOTRAC: 1-800-535-5053
DATE OF PREPARATION:	May 10, 1999

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Isobutylene	115-11-7	> 99.0%	There are no specific exposure limits for Isobutylene. Isobutylene is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					
Maximum Impurities		< 1.0%	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Isobutylene is a colorless, liquefied, flammable gas with an unpleasant odor similar to burning coal. The liquefied gas rapidly turns into a gas at standard atmospheric temperatures and pressures. Isobutylene is an asphyxiant and presents a significant health hazard by displacing the oxygen in the atmosphere. Rapid evaporation of liquid from the cylinder may cause frostbite. Both the liquid and gas pose a serious fire hazard when accidentally released. The gas is heavier than air and may travel to a source of ignition and flash back to a leak or open container. Flame or high temperature impinging on a localized area of a cylinder of Isobutylene can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for this gas is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: High concentrations of this gas can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of overexposure, death may occur. Isobutylene also has some degree of anesthetic action and can be mildly irritating to the mucous membranes. The effects associated with various levels of oxygen are as follows:

CONCENTRATION	SYMPTOMS OF EXPOSURE
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea and vomiting, collapse or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

OTHER POTENTIAL HEALTH EFFECTS: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	1
FLAMMABILITY	(RED)	4
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Overexposure to Isobutylene may cause the following health effects:

ACUTE: The most significant hazard associated with this gas is inhalation of oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, headache, dizziness, and nausea. At high concentrations, unconsciousness or death may occur. Contact with liquefied gas or rapidly expanding gases may cause frostbite.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to Isobutylene.

TARGET ORGANS: Respiratory system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO ISOBUTYLENE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations.

4. FIRST-AID MEASURES (Continued)

Remove victim(s) to fresh air as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

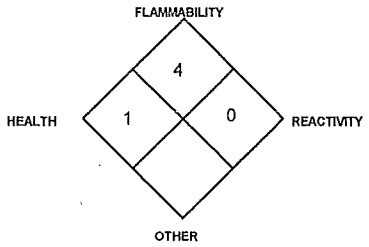
Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES

FLASH POINT (Closed Cup): -10°C (< 14°F)
AUTOIGNITION TEMPERATURE: 465°C (869°F)
FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 1.8%
Upper (UEL): 9.6%

NFPA RATING



See Section 16 for Definition of Ratings

FIRE EXTINGUISHING MATERIALS: Extinguish Isobutylene fires by shutting off the source of the gas. Use water spray or a foam agent to cool fire-exposed containers, structures, and equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this material may ignite and produce toxic gases, including carbon monoxide and carbon dioxide.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of Isobutylene can be very dangerous. Direct flame exposure on the cylinder wall can cause an explosion either by BLEVE (Boiling Liquid Expanding Vapor Explosion), or by exothermic decomposition. This is a catastrophic failure of the vessel releasing the contents into a massive fireball and explosion. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the vessel. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Static discharge may cause Isobutylene to ignite explosively if released.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation (in enclosed areas) to prevent flammable or explosive mixture formation. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Because of the potential for a BLEVE, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of vessel exposures, evacuate the area. Refer to the North American Emergency Response Guidebook for additional information. Other information for pre-planning can be found in the American Petroleum Institute Publications 2510 and 2510A.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided. Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, gloves resistant to tears, and Self-Contained Breathing Apparatus.**

Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut off with water spray. Allow the gas to dissipate. Monitor the surrounding area for combustible gas levels and oxygen. Combustible gas concentration must be below 10% of the LEL (LEL = 1.8%) prior to entry. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area and allow the gas to be released there.

THIS IS AN EXTREMELY FLAMMABLE GAS. Protection of all personnel and the area must be maintained.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Isobutylene IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of Isobutylene could occur without any significant warning symptoms.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Post "No Smoking or Open Flames" signs in storage or use areas.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Isolate from oxidizers such as oxygen, chlorine, or fluorine. Use a check valve or trap in the discharge line to prevent hazardous backflow. Post "No Smoking or Open Flame" signs in storage and use areas. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand truck. Do not drag, slide, or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap, if provided, in place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap, if provided. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Isobutylene. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 "*Oxygen Deficient Atmospheres*".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (e.g., nitrogen) before attempting repairs.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Isobutylene dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the presence of potentially explosive air-gas mixtures and level of oxygen.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% in the workplace. Maintain level of gas below the level listed in Section 2 (Composition and Information on Ingredients). Use supplied air respiratory protection if oxygen levels are below 19.5% or during emergency response to a release of Isobutylene. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards.

EYE PROTECTION: Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of liquid Isobutylene.

HAND PROTECTION: Wear gloves resistant to tears when handling cylinders of Isobutylene. Use low-temperature protective gloves (e.g., Kevlar) when working with containers of liquid Isobutylene.

BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product, as well as fire retardant items.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY @ 21.1°C (70°F): 2.396 kg/m^3 (0.1496 lb/ft^3)
SPECIFIC GRAVITY (air = 1): 1.997
SOLUBILITY IN WATER: Insoluble.
EVAPORATION RATE (nBuAc = 1): Not applicable.
ODOR THRESHOLD: Not established.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
pH: Not applicable.
FREEZING POINT: -140°C (-220.6°F)
BOILING POINT @ 1 atm: -6.9°C (19.6°F)
EXPANSION RATIO: Not applicable
VAPOR PRESSURE (psia): 39
SPECIFIC VOLUME (ft^3/lb): 6.7

APPEARANCE AND COLOR: Colorless gas with the unpleasant odor of burning coal. The liquid is also colorless and has the same unpleasant odor of burning coal.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: When ignited in the presence of oxygen, this gas will burn to produce carbon monoxide and carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers (e.g., chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks, and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture or burst.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is for pure Isobutylene.

ISOBUTYLENE:
LC_{50} (rat, inhalation) = 620 g/m^3/4 hours
LC_{50} (mouse, inhalation) = 415 g/m^3/2 hours

SUSPECTED CANCER AGENT: Isobutylene is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, and therefore is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Isobutylene may be mildly irritating to the mucous membranes. In addition, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION TO THE PRODUCT: Isobutylene is not known to cause sensitization in humans.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Isobutylene on the human reproductive system.

Mutagenicity: No mutagenic effects have been described for Isobutylene.
Embryotoxicity: No embryotoxic effects have been described for Isobutylene.
Teratogenicity: No teratogenic effects have been described for Isobutylene.
Reproductive Toxicity: No reproductive toxicity effects have been described for Isobutylene.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e., within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by overexposure to Isobutylene.

11. TOXICOLOGICAL INFORMATION (Continued)

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary. Treat symptoms and eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Isobutylene.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen-deficient environments. No adverse effect is anticipated to occur to plant life, except for frost produced in the presence of rapidly expanding gases. See Section 11, Toxicological Information, for additional information on effects on animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of Isobutylene on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to MESA Specialty Gases & Equipment Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

For Isobutylene Gas:

PROPER SHIPPING NAME:	Isobutylene
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1055
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

Alternate Description:

PROPER SHIPPING NAME:	Petroleum gases, liquefied
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1075
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

MARINE POLLUTANT: Isobutylene is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Isobutylene is not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

CANADIAN DSL/NDSL INVENTORY STATUS: Isobutylene is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Isobutylene is listed on the TSCA Inventory.

15. REGULATORY INFORMATION (Continued)

OTHER U.S. FEDERAL REGULATIONS: Isobutylene is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 lb. Depending on specific operations involving the use of Isobutylene, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Isobutylene is not listed in Appendix A; however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lb (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.

U.S. STATE REGULATORY INFORMATION: Isobutylene is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Liquefied Petroleum Gas.
California - Permissible Exposure Limits for Chemical Contaminants: Liquefied Petroleum Gas.
Florida - Substance List: Isobutylene.
Illinois - Toxic Substance List: No.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Isobutylene.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: Liquefied Petroleum Gas.
Missouri - Employer Information/Toxic Substance List: No.
New Jersey - Right to Know Hazardous Substance List: Isobutylene.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Isobutylene.
Rhode Island - Hazardous Substance List: Liquefied Petroleum Gas.
Texas - Hazardous Substance List: Liquefied Petroleum Gas.
West Virginia - Hazardous Substance List: Liquefied Petroleum Gas.
Wisconsin - Toxic and Hazardous Substances: Liquefied Petroleum Gas.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Isobutylene is not on the California Proposition 65 lists.

LABELING:

DANGER:

FLAMMABLE LIQUID AND GAS UNDER PRESSURE.
CAN FORM EXPLOSIVE MIXTURES WITH AIR.
MAY CAUSE FROSTBITE.

Keep away from heat, flames, and sparks.
Store and use with adequate ventilation.
Cylinder temperature should not exceed 52°C (125°F).
Do not get liquid in eyes, on skin, or clothing.
Close valve after each use and when empty.
Use in accordance with the Material Safety Data Sheet.

FIRST AID:

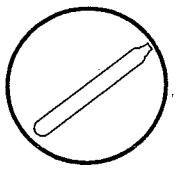
IF INHALED, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

IN CASE OF FROSTBITE, obtain immediate medical attention.

DO NOT REMOVE THIS PRODUCT LABEL.

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas
Class B1: Flammable Gas



16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. MESA Specialty Gases & Equipment assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, MESA Specialty Gases & Equipment assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.
OSHA - U.S. Occupational Safety and Health Administration. **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration **(OSHA)**. NIOSH issues exposure guidelines called Recommended Exposure Levels **(RELs)**. When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:
HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).
NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued): Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:
Much of the information related to fire and explosion is derived from the National Fire Protection Association **(NFPA)**. Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo, LDLo**, and **LDo**, or **TC, TCo, LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:
This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations.

SAFETY DATA SHEET

Version 4.20
Revision Date 11/07/2017
Print Date 10/06/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Trizma® base

Product Number : T1503
Brand : Sigma

CAS-No. : 77-86-1

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

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

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

This substance is not considered to be persistent, bioaccumulating and toxic (PBT).

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 2-Amino-2-(hydroxymethyl)-1,3-propanediol
THAM
Trometamol
Tris base
Tris(hydroxymethyl)aminomethane

Formula : $C_4H_{11}NO_3$
Molecular weight : 121.14 g/mol
CAS-No. : 77-86-1
EC-No. : 201-064-4
Registration number : 01-2119957659-16-XXXX

No components need to be disclosed according to the applicable regulations.

4. FIRST AID MEASURES

4.1 Description of first aid measures

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions
No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Hygroscopic. Store under inert gas.
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
No special environmental precautions required.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: colourlesswhite
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	10.5 - 12

e)	Melting point/freezing point	Melting point/range: 168 °C (334 °F)
f)	Initial boiling point and boiling range	288 °C (550 °F) at 1,013 hPa (760 mmHg) - Decomposes below the boiling point.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	Does not sustain combustion.
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	678 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: -2.31 at 20 °C (68 °F)
p)	Auto-ignition temperature	The substance or mixture is not classified as self heating.
q)	Decomposition temperature	No data available
r)	Viscosity	Not applicable
s)	Explosive properties	Not explosive
t)	Oxidizing properties	The substance or mixture is not classified as oxidizing.

9.2 Other safety information

Bulk density	800 kg/m3
Dissociation constant	8.22 at 25 °C (77 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
hygroscopic

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx)
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 5,000 mg/kg
(OECD Test Guideline 425)

Inhalation: No data available

LD50 Dermal - Rat - > 5,000 mg/kg
(OECD Test Guideline 402)

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
Buehler Test - Guinea pig
Does not cause skin sensitisation.
(OECD Test Guideline 406)

Germ cell mutagenicity
Result: Not mutagenic in Ames Test

in vitro assay
Result: negative
In vitro tests did not show mutagenic effects

Result: In vivo tests did not show any chromosomal changes.

Carcinogenicity

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information

Repeated dose toxicity	Rat - Oral - Subacute toxicity - NOAEL : 1,000 mg/kg

RTECS: TY2900000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic	EC50 - Daphnia (water flea) - > 980 mg/l - 48 h

invertebrates

Toxicity to algae	EC50 - Algae - 397 mg/l - 72 h
	NOEC - Algae - 100 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability	Result: - Readily biodegradable. (OECD Test Guideline 301F)

12.3 Bioaccumulative potential

No bioaccumulation is to be expected (log Pow <= 4).

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

This substance is not considered to be persistent, bioaccumulating and toxic (PBT).

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

SARA 311/312 Hazards

No SARA Hazards

Massachusetts Right To Know Components

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

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Tris (hydroxymethyl) aminomethane	77-86-1	

	CAS-No.	Revision Date
Tris (hydroxymethyl) aminomethane	77-86-1	

New Jersey Right To Know Components

	CAS-No.	Revision Date

Tris (hydroxymethyl) aminomethane 77-86-1

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

HMIS Rating

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

NFPA Rating

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

Further information
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Product Safety – Americas Region
1-800-521-8956

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APPENDIX C

COVID-19 Interim Health and Safety Guidance

COVID-19 INTERIM HEALTH AND SAFETY GUIDANCE

CORPORATE HEALTH AND SAFETY MANAGER	**:**	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	**:**	**03/2020**
REVISION DATE	**:**	**10/08/2020**
REVISION NUMBER	**:**	**5**

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1. PURPOSE

This guidance has been implemented to establish work practices, administrative procedures, and engineering controls to minimize potential exposure to SARS-CoV-2, the virus that causes COVID-19. The following guidance has been developed based on local, state and federal recommendations/requirements regarding COVID-19. The purpose of this document is to supplement existing site-specific Health and Safety Plans (HASPs) and provide interim health and safety guidance to minimize potential exposure to SARS-CoV-2. Should additional scientific information or regulatory information change, this document shall be updated accordingly.

2. SCOPE AND APPLICABILITY

This guidance covers all Roux employees and the subcontractors that Roux oversees. Site specific HASPs shall be developed to incorporate elements of mitigative measures against COVID-19 exposure. If work cannot be carried out in compliance with this guidance, the project shall be further evaluated by the Project Principal (PP), Office Manager (OM), and Corporate Health and Safety Manager (CHSM) prior to work authorization.

Roux subcontractors are required to review, comply with, and implement Roux's COVID-19 Interim Health and Safety Guidance while on site. Subcontractors may implement additional preventative measures as they see fit. All work shall be conducted in a manner consistent with the federal, state, and local guidance as it relates to COVID-19.

3. BACKGROUND

What is COVID-19?

COVID-19 is a respiratory illness that can spread from person to person. The virus that causes COVID-19 is a novel coronavirus that was first identified during an investigation into an outbreak in Wuhan, China. This virus continues to spread internationally and within the United States. There is currently no vaccine to prevent COVID-19.

What are the symptoms of COVID-19?

Reported illnesses have ranged from mild symptoms to severe illness and death for confirmed COVID-19 cases. Symptoms may appear 2 to 14 days following exposure to the virus. People with these symptoms or combinations of symptoms may have COVID-19:

- Fever or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

This list is not all possible symptoms. The CDC will continue to update this list as they learn more about the virus. For an updated symptom list please reference the following link for CDC Symptoms of Coronavirus.

If someone develops emergency warning signs for COVID-19, they should be instructed to get medical attention immediately. Emergency warning signs can include those listed below; however, this list is not all inclusive. Please consult your medical provider for any other symptoms that are severe or concerning.

- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion
- Inability to wake or stay awake
- Bluish lips or face

How does COVID-19 spread?[1]

SARS-COV-2 spreads very easily from person to person during close contact.

Individuals who are within close contact (within 6 feet) of a person with COVID-19 or have direct contact with that person are at greatest risk of infection.

- When people with COVID-19 cough, sneeze, sing, talk, or breathe they produce respiratory droplets. These droplets can range in size from larger droplets (some of which are visible) to smaller droplets. Small droplets can also form particles when they dry very quickly in the airstream.
- Infections occur mainly through exposure to respiratory droplets when a person is in close contact with someone who has COVID-19.
- Respiratory droplets cause infection when they are inhaled or deposited on mucous membranes, such as those that line the inside of the nose and mouth.
- As the respiratory droplets travel further from the person with COVID-19, the concentration of these droplets decreases. Larger droplets fall out of the air due to gravity. Smaller droplets and particles spread apart in the air.
- With passing time, the amount of infectious virus in respiratory droplets also decreases.

SARS-CoV-2 can sometimes spread by airborne transmission under certain circumstances.

Some infections can be spread by exposure to virus in small droplets and particles that can linger in the air for minutes to hours. These viruses may be able to infect people who are further than 6 feet away from the person who is infected or after that person has left the space. This kind of spread is referred to as **airborne transmission** and is an important way that infections like tuberculosis, measles, and chicken pox are spread.

- There is evidence that under certain conditions, people with COVID-19 seem to have infected others who were more than 6 feet away. These transmissions occurred within enclosed spaces that had inadequate ventilation. Sometimes the infected person was breathing heavily, for example while singing or exercising.
    - Under these circumstances, scientists believe the amount of infectious smaller droplet and particles produced by the people with COVID-19 became concentrated enough to spread the virus to other people. The people who were infected were in the same space during the same time or shortly after the person with COVID-19 had left.
- Available data indicate it is much more common for the virus that causes COVID-19 to spread through close contact with a person who has COVID-19 than through airborne transmission.[2]

Spread from contact with contaminated surfaces or objects is less common.

Respiratory droplets can also land on surfaces and objects. It is possible that a person could get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or eyes. Spread from touching surfaces is not thought to be a common way that COVID-19 spreads.

4. TRAINING REQUIREMENTS

All employees with potential exposure to COVID-19 shall be provided training that incorporates COVID-19 exposure mitigation strategies, such as implementation of proper social distancing, personal hygiene (e.g., handwashing), as well as disinfection procedures, as outlined by CDC guidelines.

5. EXPOSURE RISK POTENTIAL

Worker risk of occupational exposure to COVID-19 can vary from very high, high, medium, or lower (caution) risk. This level of exposure is dependent on several factors, which can include industry type; need for contact within

1 How COVID-19 Spreads https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html#edn1

2 Scientific Brief: SARS-CoV-2 and Potential Airborne Transmission | CDC https://www.cdc.gov/coronavirus/2019-ncov/more/scientific-brief-sars-cov-2.html

6 feet of people known to be or suspected of being infected with COVID-19; density of work environment; and industrial setting (i.e., healthcare building, occupied interior work area, minimal ventilation).

Provided below is background risk level information taken from the U.S. Department of Labor Occupational Safety and Health Administration Guidance on preparing workplaces for COVID-19. Risk evaluations for each project shall be conducted by the PP and OM in consultation with the CHSM to ensure Roux employees and subcontractors remain within the lower exposure (caution) category. If it is identified there is a medium exposure risk or higher, further evaluation and mitigative measures shall be evaluated to reduce overall exposure risk prior to work authorization.

Very High Exposure Risk (Activities not conducted by Roux)

Very high exposure risk includes occupations/work activities with high potential for exposure to known or suspected sources of COVID-19 during specific medical, postmortem, or laboratory procedures. This can include but is not limited to:

- Healthcare workers (e.g., doctors, nurses, dentists, paramedics, emergency medical technicians) performing aerosol-generating procedures (e.g., intubation, cough induction procedures, bronchoscopies, some dental procedures and exams, or invasive specimen collection) on known or suspected COVID-19 patients.
- Healthcare or laboratory personnel collecting or handling specimens from known or suspected COVID-19 patients (e.g., manipulating cultures from known or suspected COVID-19 patients).
- Morgue workers performing autopsies, which generally involve aerosol-generating procedures on the bodies of people who are known to have, or suspected of having, COVID-19 at the time of their death.

High Exposure Risk (Activities not conducted by Roux)

High exposure risk occupations/work activities include exposure to known or suspected COVID-19 positive individuals. This can include but not limited to:

- Healthcare delivery and support staff (e.g., doctors, nurses, and other hospital staff who must enter patients' rooms) exposed to known or suspected COVID-19 patients. (Note: when such workers perform aerosol-generating procedures, their exposure risk level becomes very high.)
- Medical transport workers (e.g., ambulance vehicle operators) moving known or suspected COVID-19 patients in enclosed vehicles.
- Mortuary workers involved in preparing (e.g., for burial or cremation) the bodies of people who are known to have, or suspected of having, COVID-19 at the time of their death.

Medium Exposure Risk

Medium exposure risk occupations/work activities include those that require frequent and/or close contact with (i.e., within 6 feet of) people who may be infected with COVID-19, but who are not known or suspected to be COVID-19 positive. For most of our worksites, it is assumed there is on-going community transmission for COVID-19. Therefore, workers who work at sites and may have contact with the general public, other contractors, high-population-density work environments (i.e., greater than 10 people) fall within medium exposure risk group category. This can include, but is not limited to, sampling events that require two or more workers to collect and log samples in close contact or work occurring in an interior space with limited ventilation and several workers present.

Lower Exposure Risk (Caution)

Lower exposure risk (caution) occupations/work activities are those that do not require contact with people known to be or suspected of being COVID-19 positive. During these activities, there is limited contact (i.e., within 6 feet of) the general public or other workers. Workers in this category have minimal occupational contact with the public and other coworkers. This can include construction oversight that does not require close contact as well as sampling or gauging events performed by one worker.

6. COVID-19 HEALTH SCREENING

6.1. Roux Employees

All Roux employees are required to self-attest to a COVID-19 Daily Health Questionnaire which is to be completed at home through a mobile application on scheduled workdays. The purpose of this program is to ensure business continuity as well as mitigate any potential exposure to our employees and others if it is determined employees are at-risk for contracting COVID-19. As part of this self-attestation, all employees are required to take their temperatures daily at home to confirm they do not have a fever (≥ 100.4). Employees who answer yes to any of these questions are instructed to contact their Office Manager and/or Department Head immediately and should not enter the office or go to a field site. Information shall be used to determine appropriate internal response in consultation with the Human Resources Director and Corporate Health and Safety Manager.

Below, you will find our COVID-19 Daily Health Questionnaire that all Roux employees are required to self-attest to **every scheduled workday by 9:30 am.** If employees do not promptly fill out the questionnaire by the time listed above, there will be additional follow up by HR, H&S, and/or OMs.

According to the U.S. Centers for Disease Control and Prevention & the World Health Organization, COVID-19 Symptoms include:

- *Fever (≥100. 4°F) or chills*
- *Cough*
- *Shortness of breath or difficulty breathing*
- *Fatigue*
- *Muscle or body aches*
- *Headache*
- *New loss of taste or smell*
- *Sore throat*
- *Congestion or runny nose*
- *Nausea or vomiting*
- *Diarrhea*

Have you experienced any of the COVID-19 related symptoms noted above in the last 14 days? Please Note: We do not expect employees to answer "yes" to the symptoms question if these are symptoms you normally experience due to another condition or medication.

- *Yes*
- *No*

Have you been in close contact with someone who is suspected or confirmed to have COVID-19 or who is under investigation for COVID-19 within the last 14 days? *Close contact is defined as someone who was within 6 feet of an infected person for at least 15 minutes or coming into direct contact with secretions (e.g., sharing utensils, being coughed on) from an infected person.*

- *Yes*
- *No*

Have you traveled outside of the country, been on a cruise ship and/or traveled to areas within the United States which have state mandated travel restrictions in the last 14 days?

- *Yes*
- *No*

Have you tested positive for COVID-19 within the last 14 days?

- *Yes*
- *No*

6.2. Subcontractors

In an effort to mitigate the risk of transmission of COVID-19, Subcontractors who shall perform work on-site are required to attest to the fitness of their work crew on a daily basis. This requires each worker to self-assess by asking themselves the four questions listed in the section above and also contained within the Roux Subcontractor Work Crew COVID-19 Daily Health Attestation. If any crew member answers "yes" to any of the questions, that worker is not to report to the field site and should seek proper medical advice, in accordance with local, state and federal guidelines.

On a daily basis, the subcontractor supervisor must provide the Subcontractor Work Crew COVID-19 Daily Health Attestation complete with the names of all work crew fit to be on the site for that day (i.e., who have answered "no" to all questions on the self-assessment) to Roux's Project Manager. The Subcontractor must notify Roux if there have been any "yes" responses daily. Subcontractors shall not be required to provide the name or any other personal information of any employee who has answered "yes" to any of the self-assessment questions, however, the subcontractor should provide the date and times that employee has been onsite in the prior 14 days. Records shall be maintained within the project files indicating health screening has been performed, records shall be retained for not less than 14 days following the date of submission. The Roux Subcontractor Work Crew COVID-19 Daily Health Check Attestation can be found within Appendix A.

7. SELF-ISOLATION & QUARANTINE

7.1. Self-Isolation

What if I am asked to self-isolate at home and when can I return from home isolation?

Depending on the situation, if you are COVID-19 positive or suspected to have COVID-19, employees may be required to self-isolate in their homes, as per CDC or local health department guidelines. As per CDC guidance, return from isolation has been broken out into two categories. The first includes confirmed or suspected COVID-19 individuals exhibiting symptoms, and the second includes those who have not had COVID-19 symptoms (i.e., asymptomatic), but tested positive and are under self-isolation. Both categories, along with strategies to return from home isolation, are outlined below.

People with COVID-19 under home isolation:

Accumulating evidence supports ending isolation and precautions for persons with COVID-19 using a symptom-based strategy. Specifically, researchers have reported that people with mild to moderate COVID-19 remain infectious no longer than 10 days after their symptoms began, and those with more severe illness or those who are severely immunocompromised remain infectious no longer than 20 days after their symptoms began. Therefore, CDC has updated the recommendations for discontinuing home isolation as follows:

1. **Persons with COVID-19 who have symptoms** and were directed to care for themselves at home may discontinue isolation under the following conditions:
   a. At least 10 days* have passed since symptom onset;
   b. At least 24 hours have passed since resolution of fever without the use of fever-reducing medications; and
   c. Other symptoms have improved.

* *A limited number of persons with severe illness may produce replication-competent virus beyond 10 days, which may warrant extending the duration of isolation for up to 20 days after symptom onset. Consultation with your healthcare provider will be warranted in such cases of severe illness.*

2. **Persons infected with SARS-CoV-2 who never develop COVID-19 symptoms** may discontinue isolation and other precautions 10 days after the date of their first positive RT-PCR test for SARS-CoV-2 RNA.

7.2. Quarantine

Employees may be required to self-quarantine due to potential exposure with a suspected and/or confirmed COVID-19 positive individual as well as recent travel as per local/state guidelines. People in quarantine should stay home, separate themselves from others, monitor their health, and follow directions from their state or local health department. If Roux employees meet the criteria to self-quarantine based on potential exposure/travel, they are required to self-quarantine for 14 days regardless of local/state exemptions. Even if you test negative for COVID-19 or feel healthy, symptoms may still appear 2 to 14 days after exposure to the virus.

7.2.1. Close Contact Quarantine

Employees who have come into close contact with someone who has COVID-19 are required to self-quarantine for 14 days following their last contact with the COVID-19 positive person. Close contact can be defined as being within 6 feet of someone who has COVID-19 for a total of 15 minutes or more, providing care at home to someone who is sick with COVID-19, having direct physical contact with COVID-19 individual, sharing utensils with COVID-19 individual, and being sneezed/coughed on by someone with COVID-19.

7.2.2. Travel Related Quarantine

All travel out of state must be communicated with the OM and/or Department Head prior to departure. Please note, some state/local entities require submissions of traveler health forms. It is expected all Roux employees will comply with such state/local travel requirements. All employees returning from international and/or cruise ship travel must quarantine for 14 days from the time they have returned home.

Personal Travel

Employees who will be traveling out of state are responsible for checking the local/state quarantine guidance for the regions they are traveling from and to in advance of travel and notifying their OM prior to traveling in order to evaluate the impact on the business. Based on state/local guidelines you may be required to quarantine for 14 days from the time you have returned home.

Work-Related Travel

The Project Team (i.e., PM & PP) and field staff who will be traveling are responsible for checking the local/state quarantine guidance for the regions they are traveling from and to in advance of travel and notifying their OM prior to traveling in order to evaluate the impact to the business. Additionally, health and safety considerations shall be reviewed by the OM in consultation with the CHSM regarding logistics and overnight accommodations. Based on state/local guidelines, you may be required to quarantine for 14 days from the time you have returned home.

8. WORKPLACE CONTROLS

During the project planning phase, worksite evaluations shall be carried out by the PP and OM in consultation with the CHSM to determine risk exposure levels for work activities. If it is determined there is a medium exposure risk level or higher, additional workplace controls shall be evaluated and implemented as required in addition to the basic infection prevention measures outlined below in Section 8. Additional workplace controls can include engineering controls (i.e., ventilation, physical barriers), administrative controls (i.e., minimizing contact between workers, rotating shifts, site specific training), and additional personal protective equipment (i.e., respiratory protection). If exposure risk cannot be mitigated, potential project postponement may be necessary at the discretion of the OM in consultation with the CHSM.

A Job Safety Analysis (JSA) has been developed and is provided in Appendix B, which summarizes and applies concepts within this guidance including the infection prevention measures listed below. This JSA shall be required for all field work in areas where there is community-based transmission of COVID-19.

9. INFECTION PREVENTION MEASURES

The following is basic infection prevention and personal hygiene practices which shall be implemented for all Roux field activities as well as in the office setting.

- ***Personal Hygiene***
  - Wash your hands often with soap and water for at least 20 seconds.
    - If soap and water are not available, use an alcohol-based sanitizer that contains at least 60% ethanol or 70% isopropanol.
    - Key times to wash your hands include after blowing your nose, coughing or sneezing, after using the restroom, and before eating or preparing food.
  - Do not touch your eyes, face, nose and mouth with unwashed hands.
  - Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
  - Throw potentially contaminated items (e.g., used tissues) in the trash.
- ***Avoid Close Contact/Secondary Contact with People and Potentially Contaminated Surfaces***
  - Apply appropriate social distance (6+ feet).
  - Stop handshaking—use and utilize other noncontact methods for greeting.
  - Do not work in areas with limited ventilation with other Site workers (e.g., small work trailer which lacks HVAC system). If working in a trailer, the following conditions must be met: limited to 4 workers, large enough to have the ability to apply social distance and has open windows and/or operational HVAC to ensure proper ventilation of the workspace.
  - Morning tailgate/safety meetings shall occur outside and not within work trailers.
    - Do not require employees or subcontractors to sign in using the same tailgate form. The Site Supervisor/SHSO should record names of those in attendance on the form.
    - If the Site has more than 10 workers, separate tailgate meetings should be performed in smaller groups.
  - Do not share equipment or other items with co-workers and subcontractors unless wearing appropriate PPE (e.g., nitrile gloves). Assume equipment and other surfaces are potentially contaminated and remove gloves aseptically.
  - If receiving labware or other equipment disinfect to the extent feasible. If there are concerns for contaminating labware please wear appropriate PPE (e.g., gloves) to minimize contact.
  - Contact your lab/equipment vendor to confirm equipment is properly disinfected prior to being shipped.
  - Do not carpool with others (e.g., clients, coworkers).
  - For company owned vehicles limit sharing of vehicles with coworkers. If unable to limit sharing of company owned vehicles, properly disinfect vehicle before driving with a focus on commonly touched surfaces (e.g., steering wheels, shifters, buttons, etc.).
  - Use caution when using public restrooms, portable toilets. Use paper towel as a barrier when touching door handles and faucets.
- ***Cleaning and Disinfecting***
  - Clean and disinfect frequently touched surfaces daily. Commonly touched items can include but are not limited to tables, doorknobs, light switches, countertops, handles, desks, phones, keyboards, toilets, faucets, sinks, and field equipment (i.e., photo-ionization detector, field equipment).
  - **Hard (Non-porous) Surfaces**
    - If surfaces are dirty, they should be cleaned with a detergent/soap and water prior to disinfection.

- Refer to the manufacturer's instructions to ensure safe and effective use of the product and wear appropriate personal protective equipment (e.g., gloves, safety glasses, face shield).
- Many products require:
  - Keeping surface wet for a period of time (i.e., contact time)
    - Refer to manufacturer's instructions outlining adequate contact time.
  - Precautions such as wearing gloves and making sure you have good ventilation during use of the product.
- Disposable gloves should be removed aseptically and discarded after cleaning. Wash hands immediately following removal of gloves. Refer to Appendix C for how to remove gloves aseptically.
- For disinfection, diluted household bleach solutions, alcohol solutions with at least 70% alcohol, and most common EPA-registered household disinfectants should be effective.
  - Diluted household bleach solutions can be used if appropriate for the surface. Follow manufacturer's instructions for application and proper ventilation. Check to ensure the product is not past its expiration date. Never mix household bleach with ammonia or any other cleanser. Unexpired household bleach will be effective against coronaviruses when properly diluted. Leave the solution on the surface for at least 1 minute.
    - Prepare a bleach solution by mixing:
      - 5 tablespoons (1/3 cup) bleach per gallon of water or
      - 4 teaspoons bleach per quart of water
- Products with EPA-approved emerging viral pathogen claims are expected to be effective against COVID-19. Follow the manufacturer's instructions for all cleaning and disinfecting products (e.g., concentration, application method and contact time, etc.).

- **Soft (Porous) Surfaces**
  - For soft (porous) surfaces, remove visible contamination if present and clean with appropriate cleaners indicated for use on the surfaces. After cleaning:
    - Launder items as appropriate in accordance with the manufacturer's instructions. If possible, launder using the warmest appropriate water setting for the item and dry items completely; or
    - Use products with the EPA-approved emerging viral pathogens that claim they are suitable for porous surfaces.
- **Electronics**
  - For electronics such as tablets, touch screens, keyboards, remote controls, etc. remove visible contamination if present.
    - Follow the manufacturer's instructions for all cleaning and disinfection products.
    - Consider use of wipeable covers for electronics.
    - If no manufacturer guidance is available, consider the use of alcohol-based wipes or sprays containing at least 70% alcohol to disinfect touch screens. Dry surfaces thoroughly to avoid pooling of liquids.
- ***Linens, Clothing, and Other Items that Go in the Laundry***
  - Although it is unlikely field clothing would become potentially contaminated with COVID-19, it is recommended that field staff regularly launder field clothing following any field event upon returning home.
  - In order to minimize the possibility of dispersing the virus from potentially contaminated clothing, do not shake dirty laundry.
  - Wash items as appropriate in accordance with the manufacturer's instructions. If possible, launder items using the warmest appropriate water setting for the items and dry items completely.
  - Clean and disinfect hampers or other containers used for transporting laundry according to guidance listed above.

10. CLOTH FACE COVERINGS

The CDC recommends the use of cloth face coverings in public settings where other social distancing measures are difficult to maintain, such as grocery stores and pharmacies, and especially in areas of significant community-based transmission. This recommendation is based on recent studies and an understanding that a significant portion of asymptomatic, as well as pre-symptomatic, individuals can shed the virus to others before showing symptoms. Studies indicate that COVID-19 can spread among people interacting in close proximity through speaking, coughing, or sneezing. The purpose of the cloth covering is NOT to provide protection to the wearer, but to protect the wearer from unknowingly infecting others if they are asymptomatic/pre-symptomatic. The use of cloth face coverings is to supplement and NOT replace the existing practices outlined above.

Based on existing studies and on-going recommendations and/or requirements from federal, state, and local entities, Roux is recommending the use of cloth face coverings, when appropriate. Appropriate use is defined when local authorities or clients require the use of cloth face coverings in conjunction with established social distancing, or if an employee elects to use a cloth covering on their own accord. Roux will provide cloth face coverings that shall meet the basic requirements outlined by the CDC guidance.

Cloth Face Coverings should:

- Fit snugly but comfortably against the side of the face;
- Covers your nose and mouth and secure it under your chin;
- Include multiple layers of fabric;
- Allow for breathing without restriction; and
- Be able to be laundered and machine dried with no damage or change to shape.

When donning and doffing the cloth face covering, individuals should avoid touching their eyes, nose, and mouth. Following removal of the cloth face covering, employees should wash their hands immediately using the guidelines described in Section 8 above. Cloth face coverings should be routinely washed depending on the frequency of use.

The CDC does not recommend the use of gaiters or face shields. Evaluation of these face covers is on-going but effectiveness is unknown at this time. Masks with exhalation valves or vents should NOT be worn to help prevent the person wearing the mask from spreading COVID-19 to others (source control).

Note, the cloth face coverings recommended are not surgical masks or N-95 respirators. Those are critical supplies that must continue to be reserved for healthcare workers and other medical first responders, as recommended by current CDC guidance. Should there be a requirement for workers to be in respiratory protection (e.g., full-face respirator w/cartridges, P100, N95 respirators), it shall be addressed during the project pre-planning phase, which includes discussions with the PP and OM in consultation with CHSM.

11. HOTEL SELECTION PROCESS AND OVERNIGHT/REMOTE WORK

Hotel Selection

Due to the current COVID-19 situation, Roux is recommending overnight travel be limited to the extent possible. If there is a project requiring the overnight stay at a hotel, accommodations shall be made only after the hotel and hotel's location have been vetted in accordance with Roux's established guidance as defined below. The Project Team, which includes the Project Manager (PM) and PP along with the OM, in consultation with the CHSM, shall verify the hotel has appropriate protocols in place to limit the potential exposure and spread of COVID- 19 through proper cleaning and disinfection practices. Discussions with the hotel shall include, but are not limited to, measures taken to keep guests safe during their stay, guest room sanitization schedule, training of staff regarding disinfecting protocols using EPA-approved disinfectants, hotel staff fitness for duty requirements, etc. Some example questions are listed below. Following the initial hotel assessment by the Project Team, the OM and the CHSM shall review the hotel assessment findings prior to the CHSM's authorization that the hotel may be used by any Roux employees.

Sample Questions for Evaluating Hotels

1. Is there an established COVID-19 guidance/policy your location is following?
2. What additional measures are being implemented to keep workers and customers safe?; (e.g. signs/placards, social-distancing/mask reminders)
3. Is there a guest room sanitization schedule?
4. Have staff been trained on properly cleaning/disinfecting areas?
5. What types of disinfectants are in use at your location?
6. How are you evaluating staff fitness for duty? (e.g., temperature checks, not reporting to work when sick, etc.)

Employees staying overnight should abide by the following guidance:

- Ensure you properly disinfect your room upon arrival. This should include a wipe down of all commonly touched surfaces with an approved disinfectant. Use appropriate PPE (e.g., nitrile gloves) when disinfecting surfaces.
- Place the "Do Not Disturb" placard on the room while away and consider limiting hotel housekeeping service to the extent feasible (e.g., not having the room cleaned each day) to minimize potential secondary contact with others.
- Do not spend any more time in hotel common areas (i.e., lobby, hallways, etc.) than is necessary.
- Follow proper Infection Prevention Measures found within Section 8 above.
- Have meals in your hotel room after disinfecting outer package surfaces, as outlined in Section 8 above. Do not eat in public spaces or restaurants.
- If the hotel has a restaurant or café, do not have your meal in a common area; instead order food to be picked up or delivered to your room. If delivered, opt for contactless delivery (left outside the door, delivery person knocks and leaves). Always use your own pen if you need to sign something.
- Employees may also pick up food from takeout locations, order groceries or food for delivery to the hotel. Call local restaurants to order food for delivery (call the hotel lobby for recommendations) or use food ordering apps. Some apps have options for contactless delivery.

12. TRANSPORTATION-RENTAL CARS AND ROUX-OWNED VEHICLES

Rental Cars

Due to the current COVID-19 situation, Roux recommends rental car usage be limited to the extent possible. If there is a project requiring the use of a rental car (e.g. truck/van), accommodations shall be made only after the rental car company and their store's location have been vetted in accordance with Roux's established guidance, as defined below. The Project Team (PM and PP) and OM in consultation with the CHSM shall verify the rental company where you are picking up your vehicle has appropriate protocols in place to limit the potential exposure and spread of COVID- 19 through proper cleaning and disinfection practices. Discussions with the rental car company shall include, but are not limited to, measures to be taken to keep customers safe during pickup/drop-off, rental car disinfection protocols, training of staff regarding disinfecting protocols using EPA-approved disinfectants, rental car company staff fitness for duty requirements, etc. Some example questions are listed below. Following the initial rental car company store assessment by the Project Team, the OM and the CHSM shall review the rental car company assessment findings prior to the CHSM's authorization that the rental car company store may be used by any Roux employees.

Sample Questions for Evaluating Rental Car Companies

1. Is there an established COVID-19 guidance your location is following?
2. What additional measures are being implemented to keep workers and customers safe?
3. Is there a car sanitization schedule?

4. Have staff been trained on properly cleaning/disinfecting vehicles?
5. What types of disinfections are in use at your location?
6. How are you evaluating staff fitness for duty? (e.g., temperature checks, not reporting to work when sick, etc.)

Upon vehicle pickup, employees shall don nitrile gloves and safety glasses and clean/disinfect all high-touch surfaces (steering wheel, knobs, door handles, turn signals, radio, etc.) by wiping thoroughly with approved disinfectants (following manufacturer's instructions). Aseptically remove gloves and dispose of them along with rags/wipes, appropriately. Wash hands or use hand sanitizer immediately after each episode of cleaning. Due to social distancing requirements, personnel shall not carpool to destinations.

Roux-Owned Vehicles

Due to the current COVID-19 situation, Roux-owned vehicles should be dedicated to individual employees to the extent feasible, and if authorized by the OM. In the case this cannot be accommodated, employees shall don nitrile gloves and safety glasses, and clean/disinfect all high-touch surfaces (steering wheel, knobs, door handles, turn signals, radio, etc.) by wiping thoroughly with approved disinfectants (following manufacturer's instructions). This cleaning and disinfection shall occur before and after each use of the vehicle. Aseptically remove gloves and dispose of them along with rags/wipes, appropriately. Wash hands or use hand sanitizer immediately after each episode of cleaning. Due to social distancing requirements, personnel shall not carpool to destinations.

APPENDIX A

Roux Subcontractor Work Crew

COVID-19 Daily Health Screening Questionnaire

Subcontractor Work Crew
COVID-19 Daily Health Attestation

Date:
Company Name:
Supervisor Name: Signature:
Project Name:
Site Address:
Number of Workers on site:

Prior to entry onto a field site, the following questions shall be asked by the Subcontractor Supervisor to their work crew.

It is preferred this questionnaire is completed for each individual prior to their arrival at the field site. If the answer to any of these questions is YES, the worker is not to report to the field site and seek proper medical advice, in accordance with CDC Guidelines.

The Subcontractor Supervisor must provide this form on a daily basis to the Roux primary contact for the project and notify Roux of any YES responses.

1. Have you experienced any signs/symptoms of COVID-19 such as fever (≥100.4ºF), cough, shortness of breath, chills, fatigue, muscle/body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea/vomiting or diarrhea in the last 14 days?
2. Have you been in close contact* with someone who is suspected or confirmed to have COVID-19 or who is under investigation for COVID-19 within the last 14 days?

*Close contact is defined as someone who was within 6 feet of an infected person for at least 15 minutes or coming into direct contact with secretions (e.g. sharing utensils, being coughed on) from an infected person.

3. Have you traveled outside of the country, been on a cruise ship and/or traveled to areas within the United States which have state mandated travel restrictions in the last 14 days?
4. Have you tested positive for COVID-19 within the last 14 days?

Please list the crew member's names on site for the day.

1.	9.
2.	10.
3.	11.
4.	12.
5.	13.
6.	14.
7.	15.
8.	16.

APPENDIX B

Job Safety Analysis-Working in Areas Affected by COVID-19

JOB SAFETY ANALYSIS	Ctrl. No. CVD-19	DATE: 04/16/2020	☒ NEW ☐ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Fieldwork**	**Working in Areas Affected by Coronavirus**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Kristina DeLuca	Health and Safety Specialist	Brian Hobbs	CHSM

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES – Leather/cut-resistant in field and nitrile as needed
☒ HARD HAT – In field	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING – High visibility vest in field	☐ OTHER
☒ SAFETY GLASSES – In field	☒ SAFETY SHOES – Steel/composite toe in fie		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Cloth face covering, nitrile gloves, hand soap, water source, hand sanitizer, disinfectant spray and disinfectant wipes.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

SOCIAL DISTANCING: Maintain 6' of distance between yourself and all other people at all times. If you do not believe the scope of work can be conducted while maintaining this distance, contact your Project Manager immediately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Project Preplanning	N/A	• Review and follow COVID-19 CDC, Roux, Client and local orders/protocols. • Ensure all workers are fit for duty - anyone feeling sick should remain at home even if symptoms do not align with COVID-19. If a worker has been in contact with someone potentially positive or positive for COVID-19, contact your Office Manager. • Determine PPE needs and ensure adequate supply of disinfectant wipes/spray, soap and water or hand sanitizer at Site. Due to high demands and limited supply, plan ahead. • Use the minimum number of employees necessary to safely complete the work.
2. Mobilization	**Exposure:** Becoming infected or infecting co-workers	**Personal/Rental/Roux Owned Vehicle** • Do not carpool. • Use the same vehicle every day and do not share with co-workers. • Verify workers/other people are not approaching vehicle prior to exiting the vehicle. Maintain 6' of distance from others. • DO not valet your car or allow others to use your car. If necessary, don nitrile gloves and safety glasses and clean/disinfect all high touch surfaces (steering wheel, knobs, door handles, turn signals, radio, etc.) by wiping thoroughly with approved disinfectants (follow manufacturer's instructions). This cleaning and disinfection shall occur before and after each use of the vehicle. Aseptically remove gloves and dispose of them along with rags/wipes, appropriately. Wash hands or use hand sanitizer immediately after each episode of cleaning. **Public Transportation** • Public transit should not be used unless absolutely necessary. Consider renting a car rather than taking public transit. If public transit is required, wear appropriate PPE and apply social distancing (6 ft). Use proper donning and doffing procedures for nitrile gloves. Wash hands or use hand sanitizer immediately after. **Hotel Stay (Refer to COVID-19 H&S Guidance for more info)** • If a hotel stay is deemed necessary for the given field work, ensure that you disinfect your room upon initial arrival and returning each day. Disinfect all surfaces of your room with an appropriate disinfectant using nitrile gloves. Use proper donning and doffing procedures for nitrile gloves. • Place the "Do Not Disturb" placard on the room while away and limit housekeeping services to the extent feasible during your stay to minimize the reintroduction and spread of the virus from others. Minimize, or avoid entirely, time spent in hotel common areas (i.e., the lobby, dining areas, gyms, etc.). Wash hands or use hand sanitizer often.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards, energy source; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

3. Tailgate Meeting	**Exposure:** Becoming infected or infecting co-workers	• Must occur outside or remotely (i.e. video or conference call). • Maintain at least a 6+ ft distance between you and others. • Discuss primary infection prevention measures listed below. • Do not require employees or subcontractors to sign in, the Site Supervisor shall record names on the attendance form. • If the Site has more than 10 workers, separate tailgate meetings should be performed. • Discuss COVID-19 symptoms with coworkers and subcontractors to ensure fitness for duty. Anyone exhibiting signs or symptoms should be instructed to leave the Site, contact your Project Manager.
4. Site Activities	**Exposure:** Becoming infected or infecting co-workers	• Coordinate field activities at the beginning of the day (i.e. Tailgate meeting) to minimize time spent in crowded spaces or overlap while completing job tasks. • Don cloth face coverings as appropriate. • Apply social distancing (6+ ft) when interacting with others. If anyone comes within 6 ft of you while conducting work and your work prevents you from moving away, politely ask them to move back. If others are unable to move from your space, stop work and leave area. • Do not shake hands or touch others. • Do not share equipment or other items with co-workers and subcontractors unless wearing appropriate PPE (e.g. nitrile gloves). Assume equipment and other surfaces are potentially contaminated and remove gloves aseptically (See Appendix B of Roux Interim H&S Guidance for proper glove removal). • If anyone is coughing or sneezing in your vicinity, stop work and leave the area. • Do not work in areas with limited ventilation with others. • Cover your mouth and nose with tissue or paper towel or with your elbow when coughing or sneezing and wash hands or use hand sanitizer immediately after. If sick contact SHSO/PM and leave Site immediately. • Disinfect work surfaces/areas with approved disinfectant you're responsible for (ex: desk, office doorknob, computer, etc.) at least once at the beginning of your shift and at least once at the end of your shift with either sanitizing wipes or disinfectant spray. • Phones should be operated hands free to extent feasible. Sanitize your phone on a regular basis. Disinfection should also take place whenever suspected contaminated material comes in contact with any work surfaces/areas. Wash hands or use hand sanitizer immediately after. • Avoid public spaces and going out to eat by bringing your own lunch to the Site. If performing work in high density urban areas, it is recommended all food must be consumed at or in your vehicle. Wash hands or use hand sanitizer before eating and immediately after.

Primary Infection Prevention Measures

- Wash your hands often with soap and water for at least 20 seconds.
  - If soap and water are not available, use an alcohol-based sanitizer that contains at least 60% ethanol or 70% isopropanol. Key times to wash hands include after blowing your nose, coughing or sneezing, after using the restroom, and before eating or preparing food.
- Do not touch your eyes, face, nose and mouth with unwashed hands.
- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw potentially contaminated items (e.g. used tissues) in the trash.
- Avoid close contact/secondary contact with people and potentially contaminated surfaces.
  - Apply appropriate social distance (6+ feet).
  - Stop handshaking/touching others and use caution when accessing public spaces.
- Clean and disinfect frequently touched surfaces daily. Commonly touched items can include but are not limited to tables, doorknobs, light switches, countertops, handles, desks, phones, keyboard, toilets, sinks and field equipment. If surfaces are dirty, they should be cleaned with soap and water prior to disinfection. If surface cannot be cleaned/disinfected, then wash hands or use sanitizer as soon as possible.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

APPENDIX C

How to Remove Gloves

How to Remove Gloves

To protect yourself, use the following steps to take off gloves

1

Grasp the outside of one glove at the wrist. Do not touch your bare skin.

2

Peel the glove away from your body, pulling it inside out.

3

Hold the glove you just removed in your gloved hand.

4

Peel off the second glove by putting your fingers inside the glove at the top of your wrist.

5

Turn the second glove inside out while pulling it away from your body, leaving the first glove inside the second.

6

Dispose of the gloves safely. Do not reuse the gloves.

7

Clean your hands immediately after removing gloves.

APPENDIX D

Personal Protective Equipment (PPE) Management Program

PERSONAL PROTECTIVE EQUIPMENT MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	**:**	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	**:**	**01/19**
REVISION NUMBER	**:**	**4**

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1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") has instituted the following program to establish guidelines for the selection of personal protective equipment (PPE) for use by Roux personnel performing field activities in hazardous environments. PPE is not meant to be a substitute for engineering, work practice, and/or administrative controls, but PPE should be used in conjunction with these controls to protect the employees in the work place. Clothing, body coverings, and other accessories designed to prevent worker exposure to workplace hazards are all types of PPE. To ensure adequate PPE employee-owned PPE is evaluated on a case-by-case basis to insure its adequacy, maintenance and sanitation.

2. SCOPE AND APPLICABILITY

These guidelines apply to all PPE selection decisions to be made in implementing the Roux program. The foundations for this program are the numerous Occupational Health and Safety Administration (OSHA) standards related to PPE cited in 29 CFR 1910 Subpart I, 29 CFR 1926 Subpart E, and the hazardous environment work employee protection requirements under the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 and 1926.65. To ensure hazard assessments are documented the levels of protection, types of protection and tasks requiring protection are covered in site-specific Health and Safety Plans (HASPs) and Job Safety Analyses (JSAs).

3. PROCEDURES

Due to the varied nature of site activities and the different potential hazards associated with different sites, several aspects must be considered when selecting PPE. The following text describes PPE selection logic and provides guidelines and requirements for the appropriate selection and use of PPE.

3.1 Introduction

To harm the body, chemicals must first gain entrance. The intact skin and the respiratory tract are usually the first body tissues attacked by chemical contaminants. These tissues provide barriers to some chemicals but in many cases, are damaged themselves or are highly permeable by certain chemical compounds. Personal protective equipment therefore is used to minimize or eliminate chemical compounds coming into contact with these first barrier tissues.

The proper selection of equipment is important in preventing exposures. The PM making the selection will have to take several factors into consideration. The level of protection, type and kind of equipment selected depends on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors must be made before work can be safely carried out.

3.2 Types of PPE

The type and selection of PPE must meet certain general criteria and requirements as required under OSHA 29 CFR 1910.132 and 1926.95. In addition to these general requirements, specific requirements and specifications exist for some types of PPE that form the basis of the protective clothing scheme. Following is a list of the common types of specific PPE and the specific requirements for the PPE type, where applicable:

1. Hard Hats - Regulated by 29 CFR 1910.135 and 1926.100; and, specified in ANSI Z89.1.

2. Face Shields and Safety Glasses - Regulated by 29 CFR 1910.133 and 1926.102; and, specified in ANSI Z87.1.
3. Respiratory Protection - Regulated by 29 CFR 1910.134 and 1926.103.
4. Hand Protection - Not specifically regulated.
5. Foot Protection - Regulated by 29 CFR 1910.136 and 1926.96; and, specified in ANSI Z41.1.
6. Protective Clothing (e.g., fully encapsulated suits, aprons) - Not specifically regulated.

3.3 Protective Clothing Selection Criteria

3.3.1 Chemicals Present

The most important factor in selecting PPE is the determination of what chemicals the employee may be exposed to. On field investigations, the number of chemicals may range from a few to several hundred. The exact chemicals or group of chemicals present at the site (certain groups tend to require similar protection) can be determined by collecting and analyzing samples of the air, soil, water, or other site media. When data are lacking, research into the materials used or stored at the site can be used to infer chemicals possibly on the site.

Once the known or suspected chemicals have been identified, and taking into consideration the type of work to be performed, the most appropriate clothing shall be selected.

Protective garments are made of several different substances for protection against specific chemicals. There is no universal protective material. All will decompose, be permeated by, or otherwise fail to protect under given circumstances. Fortunately, most manufacturers make guides to the use of their products (i.e., Dupont's Tyvek™ Permeation Guide). These guides are usually for gloves and coveralls and typically provide information regarding chemical degradation rates (failure of the material to maintain structural integrity when in contact with the chemical), and may provide information on the permeation rate (whether or not the material allows the chemical to pass through). When permeation tables are available, they shall be used in conjunction with degradation tables to determine the most appropriate protective material.

During most site work, chemicals are usually in mixed combinations and the protective materials are not in continuous contact with pure chemicals for long periods of time; therefore, the selected material may be adequate for the particular chemical and type of work being performed, yet not the "best" protecting material for all site chemicals and activities. Selection shall depend upon the most hazardous chemicals based on their hazards and concentrations. Sometimes layering, using several different layers of protective materials, affords the best protection.

3.3.2 Concentration of the Chemical(s)

One of the major criteria for selecting protective material is the concentration of the chemical(s) in air, liquid, and/or solid state. Airborne and liquid chemical concentrations should be compared to the OSHA standards and/or American Conference of Governmental Industrial Hygienists (ACGIH) and National Institute for Occupational Safety and Health (NIOSH) guidelines to determine the level of skin or other absorptive surface (e.g., eyes) protection needed. While these standards are not designed specifically for skin exposed directly to the liquid, they may provide skin designations indicative of chemicals known to have significant skin or dermal absorption effects. For example, airborne levels of PCB on-site may be

low because it is not very volatile, so the inhalation hazard may be minimal; however, PCB-containing liquid coming in direct contact with the skin may cause overexposure. Thus, PCB has been assigned a skin designation in both the OSHA and ACGIH exposure limit tables.

3.3.3 Physical State

The characteristics of a chemical may range from nontoxic to extremely toxic depending on its physical state. Inorganic lead in soil would not be considered toxic to site personnel, unless it became airborne, since it is generally not absorbed through the intact skin. Organic lead in a liquid could be readily absorbed. Soil is frequently contaminated with hazardous materials. Concentrations will vary from a few parts per million to nearly one hundred percent. The degree of hazard is dependent on the type of soil and concentration of the chemical. Generally speaking, "dry" soils do not cause a hazard to site personnel if they take minimal precautions such as wearing some type of lightweight gloves.

3.3.4 Length of Exposure

The length of time a material is exposed to a chemical increases the probability of breakthrough. Determinations of actual breakthrough times for short-term exposures indicate that several different materials can be used which would be considered inadequate under long-term exposures. It should be kept in mind that during testing, a pure (100% composition) liquid is usually placed in direct contact with the material producing a worst-case situation.

3.3.5 Abrasion

When selecting protective clothing, the job the employee is engaged in must be taken into consideration. Persons moving drums or performing other manual tasks may require added protection for their hands, lower chest and thighs. The use of leather gloves and a heavy apron over the other normal protective clothing will help prevent damage to the normal PPE and thus reduce worker exposures.

3.3.6 Dexterity

Although protection from skin and inhalation hazards is the primary concern when selecting PPE, the ability to perform the assigned task must be maintained. For example, personnel cannot be expected to perform work that requires fine dexterity if they must wear a thick glove. Therefore, the PPE selection process must consider the task being performed and provide PPE alternatives or techniques that allow dexterity to be maintained while still protecting the worker (e.g., wearing tight latex gloves over more bulky hand protection to increase dexterity).

3.3.7 Ability to Decontaminate

If disposable clothing cannot be used, the ability to decontaminate the materials selected must be taken into consideration. Once a chemical contacts the material, it must be cleaned before it can be reused. If the chemical has completely permeated the material, it is unlikely that the clothing can be adequately decontaminated and the material should be discarded.

3.3.8 Climactic Conditions

The human body works best with few restraints from clothing. Protective clothing adds a burden by adding weight and restricting movement as well as preventing the natural cooling process. In severe situations, a modified work program must be used.

Some materials act differently when they are very hot and very cold. For example, PVC becomes almost brittle in very cold temperatures. If there are any questions about the stability of the protective materials under different conditions, the manufacturer should be contacted.

3.3.9 Work Load

Like climactic conditions, the type of work activity may affect work duration and the ability or personnel to perform certain tasks. Similarly, the amount of protective materials a person wears will affect their ability to perform certain tasks. For example, a person in a total encapsulating suit, even at 72 ^{o}F, cannot work for more than a short period of time without requiring a break.

The work schedule should be adjusted to maintain the health of the employees. Special consideration should be given to the selection of clothing that both protects and adds the least burden when personnel are required to perform strenuous tasks. Excessive bodily stress frequently represents the most significant hazard encountered during field work.

3.4 Types of Protective Materials

1. Cellulose or Paper
2. Natural and Synthetic Fibers
    a. Tyvek™
    b. Nomex™
3. Elastomers
    a. Polyethylene
    b. Saran
    c. Polyvinyl Chloride (PVC)
    d. Neoprene
    e. Butyl Rubber
    f. Viton

3.5 Protection Levels

3.5.1 Level A Protection

Level A protection (a fully encapsulated suit) is used when skin hazards exist or when there is no known data that positively rule out skin and other absorption hazards. Since Level A protection is extremely physiologically and psychologically stressful, the decision to use this protection must be carefully considered. At no time will Level A work be performed without the consent of the OM. The following conditions suggest a need for Level A protection:

- confined facilities where probability of skin contact is high;
- sites containing known skin hazards;
- sites with no established history to rule out skin and other absorption hazards;
- atmosphere immediately dangerous to life and health (IDLH) through the skin absorption route;
- site exhibiting signs of acute mammalian toxicity (e.g., dead animals, illnesses associated with past entry into site by humans);

- sites at which sealed drums of unknown materials must be opened;
- total atmospheric readings on the Photoionization Detector (PID), Flame Ionization Detector (FID), and similar instruments indicate 500 to 1,000 ppm of unidentified substances; and
- extremely hazardous substances (e.g., cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens and infectious substances) are known or suspected to be present and skin contact is possible.

The following items constitute Level A protection:

- open circuit, pressure-demand self-contained breathing apparatus (SCBA);
- totally encapsulated suit;
- gloves, inner (surgical type);
- gloves, outer;
- chemical protective;
- boots, chemical protective, steel toe and shank;
- radiation detector (if applicable); and
- communications.

3.5.2 Level B Protection

Level B protection is utilized when the highest level of respiratory protection is needed but hazardous material exposure to the few unprotected areas of the body is unlikely.

The following conditions suggest a need for Level B protection:

- the type and atmospheric concentration of toxic substances have been identified and they require the highest level of respiratory protection;
- IDLH atmospheres where the substance or concentration in the air does not present a severe skin hazard;
- the type and concentrations of toxic substances do not meet the selection criteria permitting the use of air purifying respirators; and
- it is highly unlikely that the work being done will generate high concentrations of vapors, gases or particulates, or splashes of materials that will affect the skin of personnel.

Personal protective equipment for Level B includes:

- open circuit, pressure-demand SCBA;
- chemical protective clothing:
- overalls and long-sleeve jacket; or
- coveralls;
- gloves, inner (surgical type); gloves, outer, chemical protective;
- boots, chemical protective, steel toe and shank; and
- communications optional.

3.5.3 Level C Protection

Level C protection is utilized when both skin and respiratory hazards are well defined and the criteria for the use of negative pressure respirators have been fulfilled (i.e., known contaminants and contaminant concentrations, acceptable oxygen levels, approved filter/cartridge available, known cartridge service life, etc.). Level C protection may require carrying an emergency escape respirator during certain initial entry and site reconnaissance situations, or when applicable thereafter.

Personal protective equipment for Level C typically includes:

- full facepiece air-purifying respirator;
- emergency escape respirator (optional);
- chemical protective clothing:
  - overalls and long-sleeved jacket; or
  - coveralls;
- gloves, inner (surgical type);
- gloves, outer, chemical protective; and
- boots, chemical protective, steel toe and shank.

3.5.4 Level D Protection

Level D is the basic work uniform. Personal protective equipment for Level D includes:

- coveralls;
- safety boots/shoes;
- eye protection;
- hand protection;
- reflective traffic safety vest (mandatory for traffic areas or railyard);
- hard hat (with face shield is optional); and
- emergency escape respirator is optional.

3.5.5 Level E Protection

Level E protection is used when radioactivity above 10 mr/hr is detected at the site. Personal protective equipment for Level E includes:

- coveralls;
- air purifying respirator;
- time limits on exposure;
- appropriate dermal protection for the type of radiation present; and
- radiation dosage monitoring.

3.5.6 Additional Considerations

Field work will contain a variety of situations due to chemicals in various concentrations and combinations. These situations may be partially ameliorated by following the work practices listed below:

1. Some sort of foot protection is needed on a site. If the ground to be worked on is contaminated with liquid and it is necessary to walk in the chemicals, some sort of protective "booties" can be worn over the boots. This cuts down on decontamination requirements. They are designed with soles to help prevent them from slipping around. If non-liquids are to be encountered, a Tyvek™ bootie could be used. If the ground contains any sharp objects, the advantage of booties is questionable. Boots should be worn with either cotton or wool socks to help absorb the perspiration.

2. If the site situation requires the use of hard hats, chin straps should be used if a person will be stooping over where his/her hat may fall off. Respirator straps should not be placed over the hard hats. This will affect the fit of the respirator.

   Some types of protective materials conduct heat and cold readily. In cold conditions, natural material clothing should be worn under the protective clothing. Protective clothing should be removed prior to allowing a person "to get warm". Applying heat, such as a space heater, to the outside of the protective clothing may drive the contaminants through. In hot weather, under clothing will absorb sweat. It is recommended that workers use all cotton undergarments.

3. Body protection should be worn and taped to prevent anything from running into the top of the boot. Gloves should be worn and taped to prevent substances from entering the top of the glove. Duct tape is preferred, but masking tape can be used. When aprons are used, they should be taped across the back for added protection. However, this should be done in such a way that the person has mobility.

4. Atmospheric conditions such as precipitation, temperature, wind direction, wind velocity, and pressure determine the behavior of contaminants in air or the potential for volatile material getting into the air. These parameters should be considered in determining the need for and the level of protection.

5. A program must be established for periodic monitoring of the air during site operations. Without an air monitoring program, any changes would go undetected and might jeopardize response personnel. Monitoring can be done with various types of air pumps and filtering devices followed by analysis of the filtration media; personnel dosimeters; and periodic walk-throughs by personnel carrying real-time survey instruments.

6. For operations in the exclusion zone, different levels of protection may be selected, and various types of chemical-resistant clothing may be worn. This selection should be based on the job function, reason for being in the area, and the potential for skin contact with, or inhalation of, the chemicals present.

7. Escape masks must be readily available when levels of respiratory protection do not include a SCBA and the possibility of an IDLH atmosphere exists. Their use can be made on a case-by-case basis. Escape masks could be strategically located at the site in areas that have higher possibilities of vapors, gases or particulates.

APPENDIX E

Subsurface Utility Clearance Management Program

SUBSURFACE UTILITY CLEARANCE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	**:**	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	**:**	**01/19**
REVISION NUMBER	**:**	**2**

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1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") has instituted the following program for completing proper utility mark-outs and for conducting subsurface clearance activities. This establishes a method to ensure, to the greatest extent possible, that utilities have been identified and contact and/or damage to underground utilities and other subsurface structures will be avoided.

2. SCOPE AND APPLICABILITY

The Subsurface Utility Clearance Management Program applies to all Roux employees, its contractors and subcontractors. Employees are expected to follow this program for all intrusive work involving Roux or other personnel (e.g., contractors/subcontractors) working for Roux unless the client's requirements are more stringent. Deviation from the program regardless of the specific work activity or work location must be pre-approved based on client's site knowledge, site experience and client's willingness for the use of this program. Any and all exceptions shall be documented and pre-approved by the Project Principal and the Office Manager.

3. PROCEDURES

3.1 Before Intrusive Activities

During the project kick-off meeting for intrusive activities the PM will review the Roux Subsurface Utility Clearance Checklist and Utility Verification (Appendix C) / Site Walkthrough Record (Appendix D) and the below bullet points with the project field team:

(Please note that these are intended as general reminders only and should not be solely relied upon.)

- Ensure the Mark-out / Stake-out Request Information Sheet (or one-call report) is complete and accurate for the site including address and cross streets and review for missing utilities. (Note: utility mark-out organizations do not have contracts with all utilities and it is often necessary to contact certain utilities separately such as the local water and sewer authorities).
- Have written confirmation prior to mobilizing to the site that the firm or Roux personnel performing the intrusive activity has correctly completed the mark-out notification process including requesting mark-outs, waiting for mark-outs to be applied to ground surfaces at the site, and receiving written confirmation of findings (via fax or email) from utility operators for all known or suspected utilities in the proposed area of intrusive activity, and provided utility owner written confirmation to Roux personnel for review and project files documentation.
- Do not begin any intrusive activity until all utilities mark-out has been completed (i.e., did all utilities mark-out the site?) and any unresolved mark-out issues are finalized. Perform a site walk to review the existing utilities and determine if said utilities have been located by the utility locators.

  (Note: The Tolerance Zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside edge of any subsurface structure.)
- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or other soft digging techniques) for the first 5-ft below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-Clearance exploratory test holes should be defined in the SOW/proposal provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternative approaches will need to be pre-approved by the OM.

- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this program. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12" for first 5 feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes performed to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.
- In addition, the following activities should be conducted:
  - Review the work scope to be performed with the site owner/tenant to determine if it may impact any utilities;
  - Attempt to procure any utility maps or historic drawings of subsurface conditions of the site;
  - **Determine the need for utility owner companies to be contacted or to have their representatives on site**;
  - Where mark-outs terminate at the property boundary, consider the use of private utility locating / GPR / geophysical-type services which may be helpful in locating utilities. Use of private utility locating firms, however, does not eliminate the legal requirement for the Excavator firm to submit a request for Public Utility Mark-outs. Also, the information provided by the service may be inaccurate and unable to locate subsurface utilities and structures in urban areas, landfills, urban fill areas and below reinforced slabs, etc. They should not be relied upon as the only means of performing utility clearance;
  - Documented description of the dig site which is included in the projects Health and Safety Plan (HASP) and one call report will be maintained in the field and distributed amongst Roux personnel its contractors and subcontractors; and
  - Documentation of the actual placement of mark outs in the field shall be collected using dated pictures, videos and/or sketches with distance from markings to fixed objects. All documentation shall be maintained within the project file.

3.2 During Intrusive Activities

The PM, field team lead or personnel performing oversight is to:

- Ensure the mark-out remains valid. (In certain states there are limits regarding the duration of time after the mark-out was applied to the ground surface work can be started or interrupted.) Additionally, the mark-outs must be maintained, documented, and in many cases refreshed periodically to be considered valid, this will be accomplished through calls to the one call center.
- Ensure intrusive activities are only performed within the safe boundaries of the mark-out as detailed in the One-Call Report.
- Halt all work if intrusive activities have resulted in discovery of an unmarked utility. Roux personnel shall notify the facility owner/operator and the one call center. All incidents such as this will be reported as per Roux Incident Investigation and Reporting Management Program.
- Halt all work if intrusive activities must take place outside of the safe boundaries of a mark-out and only proceed after new mark-outs are performed.
- Halt the intrusive activities and immediately consult with the PP if an unmarked utility is encountered.
- Completing any subsurface utility clearance incident reports that are necessary.

- If a utility cannot be found as marked Roux personnel shall notify the facility owner/operator directly or through the one call center. Following notification, the excavation may continue, unless otherwise specified in state law.
- Contractors/subcontractors must contact the one-call center to refresh the ticket when the excavation continues past the life of the ticket. Ticket life shall be dictated by state law however at a maximum ticket life shall not exceed 20 working days.

3.3 Stop Work Authority

Each Roux employee has Stop Work Authority which he or she will execute upon determination of any imminent safety hazard, emergency situation, or other potentially dangerous situation, such as hazardous weather conditions. This Stop Work Authority includes subsurface clearance issues such as the adequacy of a mark-out or identification during intrusive operations of an unexpected underground utility. Authorization to proceed with work will be issued by the PM/PP after such action is reviewed and resolved. The PM will initiate and execute all management notifications and contact with emergency facilities and personnel when this action is appropriate.

Appendix A - Definitions

Intrusive Work Activities	All activities such as digging or scraping the surface, including but not limited to, excavation, test pitting or trenching, soil vapor sampling or the installation of soil borings, soil vapor monitoring points and wells, or monitoring wells, and drilling within the basement slab of a recently demolished building.
Mark-out / Stake Out	The process of contracting with a competent and qualified company to confirm the presence or absence of underground utilities and structures. This process will clearly mark-out and delineate utilities that are identified so that intrusive work activities can be performed without causing disturbance or damage to the subsurface utilities and structures. After utility mark-outs are completed the soft digging will be completed prior to intrusive work.
Tolerance Zone	Defined as two feet on either side of the designated centerline of an identified utility, plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct backs and other non-cylindrical utilities) of that utility and two feet from the outside edge of any subsurface structure.
Structure	For the purpose of this program a structure is defined as any underground feature that may a present potential source(s) of energy such as, but not limited to, utility vaults, bunkers, piping, electrical boxes, wires, conduits, culverts, utility lines, underground tanks and ducts.
Soft Digging	The safest way to remove material from unknown obstructions or services is by using tools such as a vactor or air knife, non-mechanical tools, or hand tools. The methods are clean and non-evasive and used for uncovering and exposing buried services, excavating and for providing a quick method of soil removal from sensitive areas.
Verification	Exploratory test-hole dug with hand tools within the Tolerance Zone to expose and verify the location, type, size, direction-of-run and depth of a utility or subsurface structure. Vacuum excavation (soft dig) methods can further facilitate exposure of a subsurface utility and accurately provide its location and identification prior to intrusive work approaching the Tolerance Zone.

Appendix B - Example of Completed One Call Report

Example Completed One-Call Report

New York 811

Send To: C_EMAIL Seq No: 744

Ticket No: 133451007 ROUTINE

Start Date: 12/16/13 Time: 7:00 AM Lead Time: 20

State: NY County: QUEENS Place: QUEENS
Dig Street: 46TH AVE Address:
Nearest Intersecting Street: VERNON BLVD
Second Intersecting Street: 11TH ST

Type of Work: SOIL BORINGS
Type of Equipment: GEOPROBE
Work Being Done For: ROUX

In Street: X On Sidewalk: X Private Property: Other:
On Property Location if Private: Front: Rear: Side:

Location of Work: MARK THE ENTIRE NORTH SIDE OF THE STREET AND SIDEWALK OF: 46TH AVE BETWEEN VERNON BLVD AND 11TH STREET

Remarks:

Nad: Lat: Lon: Zone:
ExCoord NW Lat: 40.7475399 Lon: -73.9534811 SE Lat: 40.7457406 Lon: -73.9493680

Company : ZEBRA ENVIROMENTAL Best Time: 6AM-5PM
Contact Name: DAVID VINES Phone: (516)596-6300
Field Contact: DAVID VINES Phone: (516)596-6300
Caller Address: 30 N PROSPECT AVE Fax Phone: (516)596-4422
LYNBROOK, NY 11563
Email Address: david@zebraenv.com

Additional Operators Notified:
ATTNY01 AT&T CORPORATION (903)753-3145
CEQ CONSOLIDATED EDISON CO. OF N.Y (800)778-9140
MCINY01 MCI (800)289-3427
PANYNJ01 PORT AUTHORITY OF NY & NJ (201)595-4841
VZQ VERIZON COMMUNICATIONS (516)297-1602

Link to Map for C_EMAIL: http://ny.itic.occinc.com/XGMZ-DF2-L23-YAY

Original Call Date: 12/11/13 Time: 1:15 PM Op: webusr
IMPORTANT NOTE: YOU MUST CONTACT ANY OTHER UTILITIES DIRECTLY

Appendix C - Roux Subsurface Utility Clearance Checklist

Roux Subsurface Utility Clearance Checklist ***Date of Revision – 12/3/14***

Work site set-up and work execution

ACTIVITY	Yes	No	N/A	COMMENTS INCLUDING JUSTIFICATION IF RESPONSE IS NO OR NOT APPLICABLE
Daily site safety meeting conducted, SPSAs performed, JSAs reviewed, appropriate work permits obtained.				
HASP is available and reviewed by site workers / visitors.				
Subsurface Utility Clearance Procedure has been reviewed with all site workers.				
Work area secured; traffic control established as needed. Emergency shut-off switch located. Fire extinguishers / other safety equipment available as needed.				
Utility mark-outs (public / private) clear and visible. Provide Excavator's Stake-Out Reference Number / Request Date / Time.				
Tolerance zone work identified.				
Work execution plan reviewed and adhered to (ground disturbance methods, clearance depths, any special utility protection requirements, or any other execution requirements; especially for Tolerance Zone work).				
Verbal endorsement received from Roux PM for any required field deviations to work execution plan.				

Key reminders for execution:

The Subsurface Utility Clearance Protocol should be referenced to determine all requirements while executing subsurface work. The bullet points below are intended as general reminders only and should not be solely relied upon.

- Tolerance zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside of any subsurface structure.
- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or vacuum excavation) must be performed for the first five feet below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-clearance exploratory test holes should be defined in the SOW/proposal provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternate approaches will need to be pre-approved by the OM.
- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this program. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft

digging around the perimeter). In these cases, dig in small lifts (<12" for first five feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.

Appendix D - Utility Verification/Site Walkthrough Record

Employee Name: _____

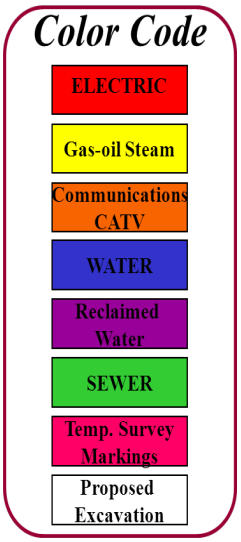
Date: _____

Instructions: For each utility suspected at the job site, indicate location on the job site, approximate burial depth, and means of detecting the utility. Leave blank if that utility is not believed to be present.

Utility	Description of Utility Location Identified Onsite	Approx. Depth (bls)	Method / Instrumentation used to determine Utility Location	Utility Owner Response (Date/Time)	Mark Out Indicates (Clear / Conflict)
Electrical Lines					
Gas Lines					
Pipelines					
Steam Lines					
Water Lines					
Sanitary and Stormwater Sewer lines					
Pressured Air-Lines					
Tank Vent Lines					
Fiber Optic Lines					
Underground Storage Tanks					
Phone Lines/ Other					

* bls - below land surface

Site Sketch Showing Utilities:



Other Comments / Findings:

Completed by: _____

Signature: _____ Date: _____

APPENDIX F

Heavy Equipment Exclusion Zone Policy

HEAVY EQUIPMENT EXCLUSION ZONE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2019**
REVISION NUMBER	:	**1**

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1. PURPOSE

The purpose of the Exclusion Zone Management Program is to establish the minimum clearance distance that must be maintained between workers and heavy equipment while equipment is in operation (i.e., engaged or moving). The intent is to have no personnel or equipment entering the Exclusion Zone while the equipment is in operation or moving to ensure that Roux and Subcontractor employees are not unnecessarily exposed to the hazards of the equipment.

2. SCOPE AND APPLICABILITY

This Management Program applies to all Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") employees and their subcontractors who are performing field work and are potentially exposed to heavy equipment. For the purpose of this program, heavy equipment includes, but is not necessarily limited to: excavation equipment, drill rigs, vacuum trucks, forklifts, lull telehandlers, man lifts, bobcats, delivery trucks, etc.

3. PROCEDURES

As specified in the following sections of this Program, an Exclusion Zones must be established and maintained during activities involving the movement/operation of heavy equipment. The Exclusion Zone requirements apply to all personnel on the site but are primarily focused on those personnel who are required to be working in the vicinity of the equipment. The exclusion zone is in effect when heavy equipment is moving or engaged (ex. movement of an arm or bucket of an excavator, rotation of an auger, lifting of a load with a forklift, raising/lowering of a man lift, etc.).

1. The Exclusion Zone must meet the following minimum requirements:
   - A minimum distance of 10 feet from all heavy equipment and loads being moved by the equipment;
   - Greater than the swing/reach radius of any moving part on the heavy equipment (i.e., for large equipment this may mean an exclusion zone distance larger than 20 feet);
   - Greater than the tip-over distance of the heavy equipment; and
   - Greater than the radius of blind spots.

   The size of the Exclusion Zone will need to be determined on a task-specific basis considering the size of the heavy equipment in use and the task being performed. Prior to all heavy equipment operations, the Exclusion Zone(s) distance must be specifically identified in the Job Safety Analysis (JSA).
2. The spotter (or another individual) should be assigned responsibility for enforcing the Exclusion Zone. The spotter should be positioned immediately outside of the Exclusion Zone within a clear line of sight of the equipment operator. The spotter must signal the operator to stop work if anyone or anything has the potential to enter or compromise the Exclusion Zone. The operator should stop work if the spotter is not within his/her line of sight. If multiple pieces of equipment are being used, each piece of equipment must have its own Exclusion Zone and spotter. For large excavation and demolition projects the spotter should be in constant radio contact (not cell phone) with the machine driver.
3. If an individual must enter the Exclusion Zone, the designated Spotter must signal the Equipment Operator to stop the equipment. Once the equipment is no longer moving (ex. movement of an arm of an excavator is STOPPED, lifting of a load with a forklift STOPPED, raising/lowering of a man lift is

STOPPED, etc.), the operator must DISENGAGE THE CONTROLS and STOP and SIGNAL BY "SHOWING HIS HANDS". This signal will indicate that it is safe for the personnel to enter the limits of the Exclusion Zone to perform the required activity. The equipment must remain completely stopped/disengaged until all personnel have exited the limits of the Exclusion Zone and the designated Spotter has signaled by "SHOWING HIS HANDS" to the Equipment Operator that it is safe to resume operations.

4. When entering the limits of the Exclusion Zone, personnel must at a minimum:
   - Establish eye contact with the operator and approach the heavy equipment in a manner that is in direct line of sight to the Equipment Operator;
   - Never walk under any suspended loads or raised booms/arms of the heavy equipment; and
   - Identify a travel path that is free of Slip/Trip/Fall hazards.
5. The Exclusion Zone should be delineated using cones with orange snow fence or solid poles between the cones, barrels, tape or other measures. For work in rights-of-way rigid barriers, such as Jersey barriers or temporary chain link fence should be used. For certain types of wide-spread or moving/mobile equipment operations, such delineation may not be practicable around pieces of equipment or individual work areas. In such instances, it is expected that the entire operation will be within a larger secure work area or that additional means will be utilized to ensure security of the work zone.

All subcontractors who provide heavy equipment operations to field projects must implement a program that meets or exceeds the expectations described above as well as any additional requirements that may be required on a client or site-specific basis.

3.1 Exceptions

It is recognized that certain heavy equipment activities may require personnel to work within the limits of the Exclusion Zone as specified in this program. Such activities may include certain excavation clearance tasks, drill crew activities or construction tasks. However, any such activity must be pre-planned with emphasis on limiting the amount and potential exposure of any activity required within the zone. The critical safety steps to mitigate the hazards associated with working within the Exclusion Zone must be defined in the JSA and potentially other project-specific plans (i.e., critical lift plans, etc.), and approved by the Roux Project Principal and client representative, if required, prior to implementation.

4. TRAINING

Many Roux projects have different requirements that are client-specific or site-specific in nature. It is the responsibility of the Project Principal (or Project Manager if delegated this responsibility by the Project Principal) to ensure that the workers assigned to his/her projects are provided orientation and training with respect to these client and/or site-specific requirements.

APPENDIX G

Generic Community Air Monitoring Plan (CAMP)

APPENDIX G

New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone 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.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should 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 level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, 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 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.
3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

APPENDIX E

Quality Assurance Project Plan/ Field Sampling Plan

Quality Assurance Project Plan/Field Sampling Plan

408 West 207th Street
Inwood, New York
Block 2203 Lot 21

May 18, 2022

Prepared for:

Inwood Lot 21 Associates LLC
111 Eighth Avenue
New York, New York 10011

Prepared by:

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209 Shafter Street
Islandia, New York 11749

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2. Remedial Alternative 1: Track 1 Unrestricted Use Cleanup

Attachments

1. Professional Profiles
2. Standard Operating Procedures, Laboratory Detection Limits for Emerging Contaminants and NYSDEC Guidance for Sampling Emerging Contaminants

1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of Harlem River Ninth Avenue Development LLC (referred to herein as 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 Action Work Plan (RAWP) for the 408 West 207th Street project occupying Tax Lot 21 of Tax Block 2203, New York, 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.

The Applicant was accepted into the Brownfield Cleanup Program (BCP) as a Volunteer. A Brownfield Cleanup Agreement (BCA) was executed on August 17, 2021 and BCP Site number C231147 has been assigned to the Site as a Volunteer. Remedial action activities will be conducted under the New York State Department of Environmental Conservation (NYSDEC) BCP. 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 sampling tasks performed during the Remedial Action.

This QAPP/FSP was prepared in accordance with the NYSDEC's DER-10 and provides guidelines and procedures to be followed by field personnel during performance of sampling during the Remedial Action. 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 laboratory analysis (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 sampling program is designed to meet the data quality objectives (DQOs) set forth in the DER-10. Specifically, analytical parameters selected for each sample, as described in Section 4, are comprehensive, and are intended to meet the following objectives:

- Analyze confirmation bottom samples;
- Analyze soil designated for offsite disposal for parameters required by the selected disposal facility; and
- Analyze offsite backfill/on-Site reuse soil to evaluate its suitability for use as backfill that meets the Unrestricted Use Soil Cleanup Objectives (UUSCOs) presented in Table 6.8 (a) of the latest revision of Title 6 of New York Code of Rules and Regulations (NYCRR) Part 375 (Part 375).

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. of Roux 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 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 Remedial Action and future remedial program for the Site. The Remedial Engineer will certify in the Remedial Investigation Report (RIR) that the investigation activities were observed by qualified environmental professionals under supervision as well as any other relevant provisions of ECL 27-1419 have been achieved in full conformance with the RIWP as well as in the Final Engineering Report (FER) that the remedial action was performed in accordance with the RAWP.

Project Manager

Valerie Sabatasso of Roux will serve as Project Manager. The Project Manager is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the work. This individual 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 has not yet been identified. 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 TestAmerica Laboratories of Edison, New Jersey, Sacramento, California, and Burlington, Vermont, NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratories (11452, 11666, and 10391, respectively). The Laboratory Project Manager is Melissa Haas. The Laboratory Project Manager will be determined prior to the start of the Work. 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 an acceptable laboratory report is prepared and submitted. The Laboratory Project Manager reports to the Field Team Leader.

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 QAPP/FSP. 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 remedial action may include soil and fill materials. Sampling locations, analytical suites, and frequency is provided below and 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 Documentation Soil Sampling

The Documentation samples for the Remedial Action are described in the RAWP and include the proposed samples to be collection during the remedial construction. The proposed samples to be collected are described below.

Bottom Confirmation Sampling

Bottom confirmation sampling will be conducted at a frequency of one sample per approximately 900 square feet of excavation area to confirm Track 1 across the Site as shown on Figure 2. The frequency of bottom sampling proposed is in accordance with the guidance provided in NYSDEC DER-10 5.4. In the event that Track 1 SCOs are not achieved in the areas shown on Figure 2, the remedy may revert to a Track 2 restricted residential use cleanup in those areas.

Twenty-four (24) bottom confirmation samples (BCS), listed on Table 20 of the RAWP, identified as BCS-21-1 through BCS-21-24 will be collected across the Site. Samples will be distributed throughout the Site and will be biased toward impacts, if any are observed.

The bottom confirmation samples will be tested for the TCL/Part 375 / TAL (TCL) list of parameters including:

- TCL/Part 375 VOC;
- TCL/Part 375 Base neutral acids (BNA)/SVOCs;
- TCL/Part 375 Pesticides;
- TCL/Part 375 Herbicides;
- TCL/Part 375 PCBs;
- TAL/Part 375 Metals (including hexavalent chromium);
- Total Cyanide; and
- Emerging Contaminants *

*ECs list includes 1,4-Dioxane and the 21 Per- and Polyfluoroalkyl Substances (PFAS) which include the 21 compounds listed in the most recent 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) is included as an attachment to this QAPP/FSP. 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. Soil samples placed on hold at the laboratory will not be analyzed for PFAS. 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

All PFAS compounds, listed above, in soil will be analyzed and reported to 0.5 microgram per kilogram (ug/kg). 1,4-Dioxane will be analyzed and reported to 0.1 milligram per kilogram (mg/kg).

Sidewall Sampling

Sidewall sampling will not be required across the Site since excavation extends to the property line.

4.2 Offsite Backfill/On-Site Reuse Soil Sampling

For offsite fill/on-Site reuse soil materials requiring chemical testing, the following samples shall be collected:

- One sample for pre-qualification chemical testing at the source location, including the following:
  1. Chemical testing shall be performed at a minimum for the parameters listed in Table 375-6.8(a) of the latest revision of Part 375. Samples will be analyzed for the same parameters and by the same methods listed in Section 4.1.
  2. Backfill/on-Site reuse soil materials excluding those materials that do not require sampling as described below, shall meet criteria presented in Section 2.0.
  3. Backfill/on-Site reuse soil materials that exceed the criteria presented in Section 2.0 shall not be imported to the Site without prior approval of the NYSDEC.
  4. The backfill/on-Site reuse soil material will be free of extraneous debris or solid waste.
  5. If the NYSDEC agrees that the material originated from a virgin source, then a minimum of one sample (i.e., the pre-qualification sample) will be collected and analyzed per source.
- If the source is not virgin, the sampling frequency will comply with DER-10 Table 5.4(e)10 shown below:

Table 5.4(e)10
Recommended Number of Soil Samples for Soil Imported To or Exported From a Site

Contaminant	VOCs	SVOCs, Inorganics & PCBs/Pesticides	
Soil Quantity (cubic yards)	Discrete Samples	Composite	Discrete Samples/Composite
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
➢ 1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

The source of the offsite fill/on-Site reuse soil must be documented by the supplier, including the location where the fill/on-Site reuse soil was obtained and a brief history of the site that is the source of the fill.

Samples of offsite backfill/on-Site reuse soil will be analyzed for the same list of parameters in Section 4.1.

All PFAS compounds, listed above, in soil will be analyzed and reported to 0.5 ug/kg. 1,4-Dioxane will be analyzed and reported to 0.1 mg/kg.

The following materials may be imported, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the site cover, provided that it contains less than 10 percent by weight material that would pass through a size 80 sieve and consists of:

- gravel, rock or stone, consisting of virgin material from a 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 2002 New York State Department of Transportation Standard Construction and Materials Volume 1.

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 RAWP implementation (i.e., soil and fill material). As discussed, the sample locations are shown on Figure 2 and additional information including intervals to be sampled and sample rationale is provided in the RAWP. Additional details regarding sampling procedures and protocols are described in Roux's relevant Standard Operating Procedures (SOPs), which are provided in Attachment 2.

5.1 Soil Sampling

Details for the collection of soil samples is provided below. Additional necessary precautions will be taken when sampling for ECs in the field, incuding but not limited to:

- Using the proper field clothing or personal protective equipment (i.e. no materials will contain Gore-Tex or Tyvek);
- Avoid 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 sharpies, permanent markers, adhesives, and waterproof/plastic clipboards and notebooks); and
- Utilizing regular ice cubes for sample presevation and only Alconox for decontamination.

5.1.1 Bottom Confirmation Sampling

Bottom confirmation soil samples will be collected from the interval beneath the terminal extent of the remedial excavation. The soil 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. 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 2.

5.2 Waste Characterization Soil Sampling

All waste characterization soil samples will be collected using pre-cleaned stainless steel sampling tools (i.e., trowels, spatulas, etc.) or new Ziploc® bags. As noted above, waste characterization samples will be collected as required by the selected disposal facility. In general, where composite samples are required for waste characterization or offsite fill/on-Site reuse soil material samples, composite samples will be collected from a minimum of three locations across the stockpiled materials. The exception is for VOC samples, which will be collected as grab samples.

5.3 Offsite Backfill/On-Site Reuse Soil Sampling

All imported fill/on-Site reuse soil material samples will be collected using pre-cleaned stainless steel sampling tools (i.e., trowels, spatulas, etc.) or new Ziploc® bags. In general, where composite samples are required for offsite fill/on-Site reuse soil material samples, composite samples will be collected from a minimum of three locations across the stockpiled materials. The exception is for VOC samples, which will be collected as grab samples.

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 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 portions, 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 fieldwork and to decide if additional samples are required.

All samples being shipped offsite 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 laboratory.

6.3 Sample Shipment

Laboratory analysis will be completed by TestAmerica Laboratories of Edison, New Jersey, Sacramento, California, and Burlington, Vermont, NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratories (11452, 11666, and 10391, respectively). 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 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 appropriately at the bottom of the cooler to act as a cushion for the sample containers.
6. Arrange containers in the cooler so 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

Laboratory Data Consultants, Inc. will review the analytical data for quality assurance and quality control in accordance with NYSDEC standards. The professional profile for Laboratory Data Consultants, Inc. is provided in Attachment 1. A laboratory SOP for analysis of PFAS is included in Attachment 2.

The primary intended use for the Remedial Action data is to confirm if remediation has been performed in accordance with the RAWP at the Site. The primary DQO of the soil program, therefore, is that data be accurate and precise, thus, 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”). Field blanks for PFAS will be collected at a minimum frequency of one per day.

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 Remedial Action. Table 3 lists the preservation, holding times and sample container information.

All RAWP “assessment” analyses (i.e., TCL/Part 375 / TAL, ECs) 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) and recent updated procedures enacted in November 2018. A Data Usability Report 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 SRI. The DUSR will be prepared by Judy Harry, a third-party data validator. Validator resume is included in Attachment 1.

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 of the RAWP.

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 2. 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.

Only "PFAS-free" water will be used for decontamination of sample equipment onsite. Only Alconox will be used as decontamination detergent (Liquinox shall not be used).

7.2 Waste Handling and Disposal

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

Respectfully submitted,

ROUX ENVIRONMENTAL ENGINEERING AND GEOLOGY, D.P.C.

Valerie Sabatasso
Project Manager

Jessica Taylor, P.G.
Principal Hydrogeologist

Noelle Clarke, P.E.
Principal Engineer

TABLES

1. Field and Laboratory QC Summary
2. Remedial Action 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	Precision
Trip Blank	1 per VOC cooler	Sensitivity
Field Blank (non-PFAS)	1 per matrix per 20 samples	Sensitivity
Field Blank (PFAS)	1 per matrix per day	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

Notes:

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 Action Sampling Summary

Sample Medium	Target Analytes	Field Samples	Replicates[1]	Trip Blanks[2]	Field Blanks[1]	Matrix Spikes[1]	Spike Duplicates[1]	Total No. of Samples
Bottom Confirmation Soil Samples	TCL/Part 375 VOCs	24	2	6	2	2	2	38
	TCL/Part 375 SVOCs	24	2	0	2	2	2	32
	TCL/Part 375 Pesticides	24	2	0	2	2	2	32
	TCL/Part 375 Herbicides	24	2	0	2	2	2	32
	TCL/Part 375 PCBs	24	2	0	2	2	2	32
	TAL Metals	24	2	0	2	2	2	32
	PFAS, 1,4 dioxane	24	2	0	6	2	2	36
Soil (Import for Backfill/On-Site Reuse)	TCL/Part 375 VOCs	9	1	1	1	1	1	14
	TCL/Part 375 SVOCs	3	1	0	1	1	1	7
	TAL/Part 375 Metals	3	1	0	1	1	1	7
	TAL/Part 375 Pesticides	3	1	0	1	1	1	7
	TCL/Part 375 Herbicides	3	1	0	1	1	1	7
	Total Cyanide	3	1	0	1	1	1	7
	TCL PCBs	3	1	0	1	1	1	7
	PFAS, 1,4 dioxane	3	1	0	1	1	1	7

Totals are estimated based on scope of work as written, actual sample quantities may vary based on field conditions. QA/QC sample quantities will be adjusted accordingly.

[1] Based on 1 per day for PFAS or 1 per 20 samples. Assumes up to 10 sampling events conducted over time as the excavation progress.

[2] Based on 1 cooler per day

TCL/Part 375 - USEPA Contract Laboratory Program Target Compound List

USEPA - United States Environmental Protection Agency

VOCs - Volatile Organic Compounds

SVOCs - Semivolatile Organic Compounds

PCBs - Polychlorinated Biphenyls

PFAS - Per- and Polyfluoroalkyl Substances

TAL - USEPA Contract Laboratory Program Target Analyte List

Table 3. Preservation, Holding Times and Sample Containers

Analysis	Matrix	Bottle Type	Preservation(a)	Holding Time(b)
TAL/Part 375 Metals (total) SW-846 6010D	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
Mercury SW-846 7471B	Soil Water	2 oz wide mouth glass, teflon lined cap 500 mL plastic bottle	Cool to 4°C Cool to 4°C	
Hexavalent Chromium	Soil	2 oz wide mouth glass, teflon lined cap	Cool to 4°C	30 days from sample collection to extraction; 7 days following extraction
SW-846 7196A	Water	500 mL plastic bottle	Cool to 4°C	24 hours from sample collection
Total Cyanide SW-846 9010C	Soil Water	4 oz wide mouth glass, teflon lined cap 250 mL plastic bottle	Cool to 4°C NaOH	14 days from sample collection 14 days from sample collection
PFAS via EPA 537(M) LCMSMS-Isotope Dilution	Soil	One 8 oz HDPE bottle One 2 oz HDPE bottle	Cool to 4°C	14 days to extract, 40 days to analysis
PFAS via EPA 537(M) LCMSMS-Isotope Dilution	Water	Two, 250 mL HDPE bottles	Cool to 4°C	14 days from sample collection
1,4-Dioxane via 8270D 1,4-Dioxane via 8270D-SIM	Soil Water	4 oz wide mouth glass, teflon lined cap Two, 250 mL amber glass	Cool to 4°C Cool to 4°C	14 days to extract, 40 days to analysis 7 days from sample collection
TO-15	Air	6 liter 8-hour runtime Summa canister	None	14 days from sample collection
Target Compound List (TCL)/Part 375				
TCL/Part 375 Volatile Organic Compounds (VOCs)	Soil	Three 5 gram Encore samplers One 2 oz plastic bottle, teflon lined cap	Cool to 4°C	48 hours, or 14 days if extruded into sealed vial and either frozen to -7 degrees C or extruded into methanol
SW-846 8260C	Water	Three 40mL VOA vials, teflon lined cap	Hydrochloric Acid	14 days from sample collection
TCL/Part 375 Semivolatile Organic Compounds (SVOCs) SW-846 8270D	Soil Water	8 oz wide mouth glass, teflon lined cap Two 250 milliliter 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/Part 375 Pesticides SW-846 8081B	Soil Water	8 oz wide mouth glass, teflon lined cap Two 120 milliliter 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/Part 375 Herbicides SW-846 8151A	Soil Water	8 oz wide mouth glass, teflon lined cap Two 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/Part 375 Polychlorinated biphenyls (PCBs) SW-846 8082A	Soil Water	8 oz wide mouth glass, teflon lined cap Two 120 milliliter 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
PFAS - Per- and Polyfluoroalkyl Substances
TCL - USEPA Contract Laboratory Program Target Compound List
USEPA - United States Environmental Protection Agency

FIGURES

1. Site Location Map
2. Remedial Alternative 1: Track 1 Unrestricted Use Cleanup

QUADRANGLE LOCATION

N

1,000 0 1,000'

Title:

SITE LOCATION MAP

408 WEST 207TH STREET
MANHATTAN, NEW YORK

Prepared for:

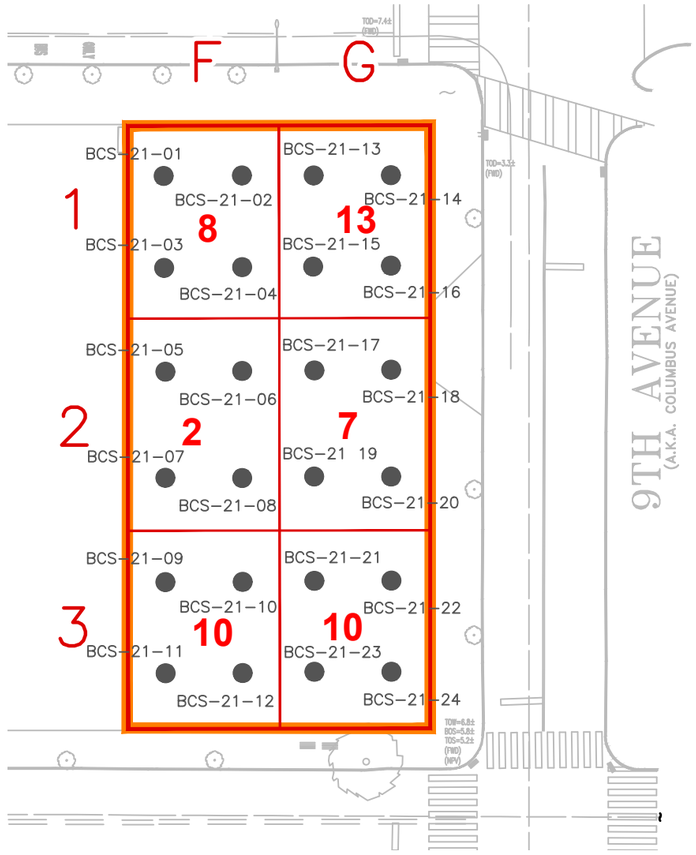
HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: D.M.	Date: 01/17/22
Prepared by: M.S.R.	Scale: AS SHOWN
Project Mgr: V.S.	Project: 2477.0008Y000
File: 2477.0008Y138.1.mxd	

FIGURE 1

V:\GIS\PROJECTS\2477Y\0008Y\138\2477.0008Y138.1.MXD



LEGEND

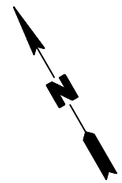
10	PROPOSED REMEDIAL EXCAVATION DEPTH TO MEET UUSCOS (FT BLS) (SEE NOTE 1)
BCS-09-01 ●	PROPOSED BOTTOM CONFIRMATION SAMPLE LOCATION AND DESIGNATION (SEE NOTE 2)
▬	WASTE CHARACTERIZATION GRID
▬	SITE BOUNDARY
NAVD88	NORTH AMERICAN VERTICAL DATUM 1988
RRSCO	RESTRICTED RESIDENTIAL SOIL CLEANUP OBJECTIVE
UUSCO	UNRESTRICTED USE SOIL CLEANUP OBJECTIVE
BCS	BOTTOM CONFIRMATION SAMPLE
FT BLS	FEET BELOW LAND SURFACE
RAWP	REMEDIAL ACTION WORK PLAN

NOTES

1. REMEDIAL EXCAVATION DEPTHS ARE SHOWN AND ARE BASED ON THE DEPTH INTERVAL OF THE DEEPEST REMEDIAL INVESTIGATION SAMPLE EXCEEDANCE OF UUSCOS WITHIN EACH GRID. IT SHOULD BE NOTED THAT THE ENTIRE SITE WILL BE EXCAVATED TO ELEVATION −1.5 FT NAVD88 FOR REDEVELOPMENT PURPOSES. THEREFORE, THERE WILL BE NO INTERNAL SIDEWALLS BETWEEN THE GRIDS SINCE NO SOIL WILL REMAIN.
2. PROPOSED BOTTOM CONFIRMATION SAMPLES ARE SHOWN. REFER TO SECTION 10.2.1 OF THE RAWP FOR A DESCRIPTION OF SAMPLING FREQUENCIES AND ANALYTES. LOCATIONS ARE APPROXIMATE AND WILL BE BIASED TOWARD IMPACTS OBSERVED, IF ANY.
3. IF UUSCOS ARE NOT MET ACROSS ALL OR PART OF THE SITE, THE REMEDY WILL REVERT TO TRACK 2 RESTRICTED RESIDENTIAL CLEANUP AND AN ENVIRONMENTAL EASEMENT AND SITE MANAGEMENT PLAN WILL BE PUT IN PLACE.
4. THE TOPOGRAPHY OF THE SITE IS SLOPED TO THE EAST. THEREFORE, THE EXCAVATION DEPTH REQUIRED TO REACH THE PROPOSED REMEDIAL OR REDEVELOPMENT ELEVATIONS IS SHALLOWER ON THE EAST SIDE OF THE SITE COMPARED TO THE WEST SIDE OF THE SITE.
5. BACKFILL, IF REQUIRED, WILL MEET UUSCOS. FILL MATERIALS WITH LESS THAN 10 PERCENT PASSING THE NUMBER 80 SIEVE (I.E., VIRGIN STONE, VIRGIN GRAVEL, ETC.) DO NOT REQUIRE SAMPLING.

REFERENCE:

CONTROL POINT SURVEY V−001.00 DATED 7/10/2018. ALL 2021 REMEDIAL INVESTIGATION SAMPLE LOCATIONS SURVEYED BY MEGA ENGINEERING AND LAND SURVEYING, P.C. IN NOVEMBER 2021.



50’ 0 50’

Title:

REMEDIAL ALTERNATIVE 1: TRACK 1 UNRESTRICTED USE CLEANUP

408 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: N.C.	Date: 08MAR22	FIGURE
Prepared by: N.C.	Scale: AS SHOWN	2
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y138.07R.DWG		

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ATTACHMENT 1

Professional Profiles

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

Sixteen 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 ongoing 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.

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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.

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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

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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

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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.

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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.

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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

Over five 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

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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.

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ROUX

PROFESSIONAL PROFILE

David E. Kaiser, P.E.
Senior Engineer

TECHNICAL SPECIALTIES

Engineering services including development and review of design drawings, implementation of design, development of technical specifications, review of construction submittals, development of SWPPPs, field management and site safety of various heavy construction projects, and civil/remediation engineering construction management. Designs have included stormwater drainage systems, NYCDEP sewer system, NYCDOB/DOT sidewalk project, and remedial system design. Additional services including budget management, permitting, project coordination, project scheduling, development of bid packages and cost estimating.

Field management and construction oversight of heavy equipment construction including sewer construction, drainage construction, crane lift activities and remedial construction activities. Environmental site assessments focusing on soil, soil vapor, groundwater and excavation dewatering investigations.

EXPERIENCE SUMMARY

Twelve years of experience: Project Engineer with Roux Environmental Engineering & Geology, D.P.C.; Design Engineer with Bohler Engineering.

CREDENTIALS

B.E. Civil Engineering, Hofstra University, 2006
Fundamentals of Engineering E.I.T. Certification, 2006
Professional Engineer (NY), 2017
OSHA 40-Hour HAZWOPER Training, 2008
OSHA 30-Hour Construction Safety Training, 2011
OSHA 10-Hour Construction Safety Training, 2018
OSHA 8-Hour Hazardous Waste Refresher Training, 2017
LPS 8-Hour Training Certification, 2008
First Aid and CPR Certified, 2016
DOT Hazardous Materials Awareness Training, 2017
NYSDEC Erosion and Sediment Control Training, 2016
Transportation Worker Identification Credential (TWIC)

KEY PROJECTS

- Land Development Site Plan Preparation – Design Engineer for the design and development of residential, commercial and industrial site plan packages for Suffolk County, Nassau County and New York City Boroughs. Site plan packages for the various municipalities within Suffolk County, Nassau County and New York City included components such as: zoning analysis, site removals plan, site design and construction documents, water and sewer system design (detention and retention systems), site grading and drainage plans, and lighting analysis and design.
- Suffolk County Drywell Closure – Senior Engineer for the planning and coordination of closing existing drywell structures serving as sanitary and industrial retention basins for an industrial facility. The project consisted of developing a sampling plan for the site, coordinating sampling and inspection of existing sanitary and industrial drywells in accordance with Suffolk County Department of Health Services Article 12, SOP No. 9-95 Pumpout and Soil Cleanup Criteria. Following the sampling event, a summary of results was prepared and sent to the SCDHS for review. Due to exceedances that were present within the septic tanks, a remedial action work plan was developed to identify the required steps for successful closure, which included coordinating the SCDHS field inspection, extraction of contaminated liquids and solids, and proper disposal of the waste.
- Property Drainage System Design and Construction – Project Engineer for the design and development of a new on-site stormwater treatment system located at a former petroleum terminal in Brooklyn, NY. Design included drainage improvements and modifications for the former petroleum terminal to support ongoing remediation activities that were being conducted to facilitate the future closure of an existing in-ground oil/water separator and removal of associated piping, and to support the anticipated long-term remedy for, and potential future redevelopment of the subject property. The proposed drainage modifications included the installation of new drainage structures, Contech treatment structures and conveyance piping to collect and treat stormwater runoff within the property and bypass the existing in-ground oil/water separator, prior to discharging the stormwater via an existing SPDES outfall.
- Oil/Water Separator Closure – Project Engineer for engineering support and review for the closure of an existing in-ground oil/water separator at a former petroleum terminal in Brooklyn, NY. The closure and abandonment of the oil/water separator was deemed the long-term remedy as approved by the NYSDEC. The oil/water separator was originally constructed in the early 1900s and has served the property by providing stormwater runoff treatment. The closure project includes the following tasks: dewatering and treatment of separator water; excavation of existing sludge in separator; dewatering and drying/stabilization of the sludge removed; power washing of interior; backfill and compaction of clean fill inside separator; removal of all existing above-grade structures including catwalks, guardrails, and piping; proper shipping and disposal of sludge contents; installation of a final cover system consisting of a geosynthetic clay liner (GCL) and filter fabric barrier; and final site grading.
- Treatment System Building Upgrades – Project Engineer for the review and implementation of engineering drawings for a metals removal system

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David E. Kaiser, P.E.
Senior Engineer

upgrade to an existing 450-gpm groundwater treatment system. The upgrades consisted of: relocating and reinstalling the existing oil/water separator tank on a steel spacer via crane; lifting and installing the existing 10,000 gallon equalization tank to be repurposed as a filter backwash solids removal tank; lifting and installing prefabricated concrete pads with a subbase of Geogrid BX1200 and 6" of aggregate size number 57 (as per NYCDDC Highway Specifications and ASTM C33) compacted to 95% Standard Proctor, under proposed tank locations; locating a new 20,000 gallon equalization/aeration tank on the new pad; installing of new blower motor and enclosure; and installing of new piping and appurtenances.

- NYCDEP Private Storm and Sanitary Sewer System – Project/Staff Engineer for the design and development of a New York City Department of Environmental Protection (NYCDEP) Private Storm and Sanitary Sewer System located at a former petroleum terminal in Brooklyn, NY. The sewer system comprised of over 2,600 LF of sewer in Greenpoint, Brooklyn over two phases of construction. During the duration of this project, responsibilities included: develop/revise NYCDEP sewer design plans and construction notes, address NYCDEP comments and markups, develop Bill of Materials, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDEP and NYCDOT specifications and requirements, develop/revise NYCDOT Builder's Pavement Plan (BPP), develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, review subcontractor submittals and cut sheets, address NYCDEP punch list items, and management/oversight/coordination of subcontractor construction activities.
- NYCDOB/NYCDOT Sidewalk Installation – Project/Staff Engineer for the design, development, and installation of over 4,000 linear feet of new sidewalks over various phases located at a former petroleum terminal in Brooklyn, NY. The design, development, and installation of these sidewalks were in accordance with the New York City Department of Buildings and New York City Department of Transportation specifications and details of construction. During the duration of these projects, my major responsibilities included: develop/revise NYCDOT Builder's Pavement Plans, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDOB and NYCDOT specifications and requirements, develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, ensure proper installation and testing of sidewalks in accordance with NYCDOB and NYCDOT, and management/oversight/coordination of subcontractor construction activities.
- Sub Slab Depressurization System – Staff Engineer for the design and construction of two sub slab depressurization systems (SSDS) located within the footprint of a petroleum remediation site where a new building was proposed to be built. These projects were part of an Interim Remedial Measure (IRM) Action Plan as approved by the NYSDEC to provide a preventative proactive measure to address potential soil vapor issues. The SSDSs were designed to operate passively; however, header piping was installed to allow for the installation of the necessary equipment if an active system was required. The SSDSs consisted of ¾-inch gravel with 4-inch diameter polyvinyl chloride (PVC) schedule 40 well screen used as soil gas collection piping and 6-inch diameter solid PVC used as the header piping. A vapor barrier/waterproofing membrane and nonwoven geotextile fabric were installed between the venting layer and the floor slab. All penetrations through the floor slab were sealed using a silicone-based waterproof sealant. The scope of work included excavation and trench work for the SSDS; placement of pipe bedding; jointing and installation of the pipe fittings, valves and appurtenances; installation of pipe sleeves and mechanical seals; and installation of nonwoven geotextile fabric and silicone-based waterproof sealant.
- Stormwater Pollution Prevention Plan (SWPPP) Reports – Staff Engineer for preparing and submitting Stormwater Pollution Prevention Plans (SWPPP) for various residential and commercial development sites in New York City and Long Island. The scope of work included preparation of SWPPP Reports in accordance with the most current New York State Department of Environmental Conservation (NYSDEC) regulations at the time, including the 'General Permit for Stormwater Discharges from Construction Activity' and the 'New York State Stormwater Management Design Manual'. Preparation of the SWPPP Reports included: summarizing the site history and project description, soil geology, potential pollutants, erosion and sediment control practices, inspection and maintenance procedures, water quantity and water quality control plans, construction sequence scheduling, and the Notice of Intent (NOI) for each project as required by the NYSDEC.

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LABORATORY DATA CONSULTANTS, INC.
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LDC Company Profile

LDC is a small, minority-owned (SBE/MBE) quality assurance and environmental chemistry company focused on data validation, data quality assessment, database implementation, and data usability. Our primary services include data validation, electronic transfer of data, oversight of quality assurance/quality control (QA/QC) programs, laboratory and field audits, technical support for litigation, and database management. Our corporate office located in Carlsbad, California is directed by Mr. Scott Denzer and Ms. Stella Cuenco, principal chemists with over 45 years of experience between them in the environmental laboratory and data validation industries

LDC is recognized as one of the leaders in the data validation industry through participation on major DoD and commercial projects such as:

- Army Corps of Engineers, DuPont Chambers (Baltimore District)
- Army Corps of Engineers, DuPont Chambers (Philadelphia District)
- Army Corps of Engineers, Various projects (New Mexico)
- Army Corps of Engineers, Camp Navajo (Tetra Tech)
- Army Corps of Engineers, Various projects, 8a Contract (Sacramento District)
- Army Corps of Engineers, Fort Ord (Shaw E&I)
- Las Vegas Wash Henderson Site (ERM)
- DOE NPR-1 Elk Hills (DOE direct and Ahtna)
- Nevada Environmental Response Trust (NERT) Henderson Site (Ramboll Environ)
- NOAA MDRA Mississippi Site (Entrix)
- Stringfellow Superfund Site (DTSC)
- BKK Landfill (Ramboll Environ)
- EPA Region IX ESAT QA Program (ICF)
- AFCEE/AFCEC, Andersen AFB (EA/Shaw)
- AFCEE/AFCEC, Loring/Pease AFB (Bechtel/MWH)
- AFCEE/AFCEC, Mather AFB (MWH)
- AFCEE/AFCEC, Army Corps of Engineers, Travis AFB (CH2M Hill)
- AFCEE/AFCEC, McClellan and Castle AFB (Jacobs Engineering Group)
- AFCEE/AFCEC, Beale AFB (Law/Crandall, Inc.)
- AFCEE/AFCEC, Andrews AFB (URS)
- Navy CLEAN Atlantic Division (EA Engineering)
- Navy CLEAN IV Southwest DIV (AECOM)
- Navy RAC Southwest Division (OHM Remediation/IT Group/Shaw)

LDC has successfully performed over 500 data validation projects worth over 10 million dollars for prime contractors servicing Air Force (AFCEE/AFCEC), Army Corps, Navy, and industrial activities.

LDC has developed well-documented procedures which support all facets of the data validation process. This includes critical steps such as:

- Project tracking
- Peer review for all data validation activities
- Internal training programs
- Internal and external audits
- Strict documentation
- Electronic deliverables

LDC as the "Best Value" Contractor

LDC is a data validation subcontractor with an impeccable track record for timeliness, quality, technical expertise, and the ability to mitigate complex data quality issues. Our clients will confirm our current and past performance under DoD (including USACE), DoE, and commercial programs. We have experience and a proven track record commensurate with the requirements of this RFP as demonstrated by the following:

- **LDC is the software developer and expert in the use of the Automated Data Review (ADR) software**. LDC has been using ADR.NET and has the current version in full implementation which meets USACE and current DoD QSM requirements. LDC has performed over 1000 ADR projects in the past 10 years, worth over $2,000,000 in revenue. LDC will provide technical support to the Client as needed for e-QAPP generation or EDD troubleshooting.

- Data validation experience as a subcontractor for more than 100 Army Corps sites, over 140 AFCEE/AFCEC sites, several EPA sites, and under 6 Navy CLEAN and RAC contracts and 150 Navy sites. This experience includes 15 years of data validation work under USACE direction and thorough understanding of the USACE Baltimore, EPA Region 2 and 3 validation guidelines, and the DoD QSM.

- Successful completion of USACE data validation activities since 1992 under subcontracts to various Districts including New England, Baltimore, Philadelphia, Omaha, Albuquerque, Seattle, Sacramento, and Jacksonville.

- Recent project experience in the Eastern region including support to four separate contractors on the Passaic River for varied projects and programs with revenues of 200K, and Gowanus Canal with GEI, revenues of 33K.

- **On-time delivery record of greater than 99%** with the ability to expedite turnaround as needed due to our large experienced staff as noted above.

- Successful completion of five DoD and two DoE audits to approve LDC's internal data validation procedures, QA program and documentation systems. (prior to 2000)

- Thorough secondary QA review program and **the capacity (33 full time chemistry staff) to handle a project of this magnitude and importance.** This significantly reduces additional work the consultant might otherwise need to do upon receipt of LDC reports.

Data Validation Capacity

LDC is continually evaluating and monitoring its capacity to meet client needs. It is company policy to not accept a project unless the service can be completed on-time with our expected quality of performance. This policy has proved very successful in meeting past project deadlines. Our client references will confirm our performance of on-time delivery.

Due to the versatile capabilities of our staff, personnel can also support multiple areas which are high in backlog. Our training program documents personnel approvals for all data review activities. All of our staff actively participate in the LDC training program.

LDC has met its contractual turnaround time requirement on over 99% of the projects completed. LDC has successfully completed projects which required data review capacity of as many as 2000 samples in one month.

Technical / Management Approach

LDC has established data validation and data management procedures which enable the thorough, consistent, timely, and efficient review of analytical data. Ms. Stella Cuenco, principal chemist, is responsible for all data validation related activities and has final authority for the company. The designated Project Manager will coordinate the day to day data validation activities and interface with the Client project chemist or PM as necessary. For day to day data review activities, data validators report directly to the senior chemist in the section of the review. Senior chemists report to the technical project manager. Data validation will be performed following the Client project specific requirements as stated in the Scope of Work (SOW).

As the Client alerts LDC of in-coming SDGs and associated ADR EDDs, the LDC project manager will log the order into the up-coming project list identified as the "LDC Project Backlog" form. This is now considered a booked order and is reserved a place in the schedule. The project manager will allocate and schedule staff resources for the project. He will generate a project specific summary which will detail the expected receipt date of the order, the due date, special method or QC requirements, and the data quality objectives (DQOs) of the project.

Once the data packages arrive, the packages are logged in according to LDC SOP 6.0.0 "Standard Operating Procedure for Sample Data Log-in". Computer generated worksheets for each SDG along with the "LDC SDG Table" and "LDC Sample Validation" spreadsheet are distributed to all project staff.

The "LDC SDG Table" spreadsheet is specific to each order and provides the project manager with an overview of individual SDGs and their associated analyses. Progress of projects is indicated daily on the spreadsheet. The "LDC Sample Validation" spreadsheet identifies individual analysis requested for all samples and supports the data reviewer in verifying that appropriate samples have been reviewed in each data package. The previously discussed tools and processes have been used to successfully meet deadlines and estimate project completion dates. Meetings are held routinely to assess the status of each project.

Throughout the data review process, the project manager monitors project status as stated above. If any scheduling or technical complications arise such that the quality of the review will be impacted, data review staff notify the project manager immediately for resolution. The project manager will keep the Client chemist current on the progress of all validation activities on a

routine basis via e-mail and telephone. Once the data review worksheets have been completed and approved by a secondary review, the final technical reports are written. All final technical reports are reviewed by at least two senior staff. This may include the Technical Project Manager, QA Director, or Lead Chemist. Upon shipping the final report, the Client project chemist will be contacted by phone.

Data Review/Validation Process

The data review and validation level of effort required for the Scope of Work outlined for this project will encompass several activities. The steps can be categorized in the following manner:

1) Sample Log-in

All samples submitted for data validation are entered into the LDC Log-in system. The system generates various spreadsheets for sample tracking, listings of laboratory and client identifications, sampling dates, analysis requested, matrix, and project due date. These tracking documents are distributed to all data validation, QA and project management staff.

2) Pre-screening of Data Packages

The pre-screening is performed concurrently with the sample log-in process. This task verifies sample chain-of-custody, data package completeness, and concurrence with the authorized delivery order.

3) Data Validation

The execution of the data review task requires the highest level of effort. The review process will be handled in a stepwise fashion including manual and automated data review. The validator will use manual review to document each finding on a Validation Findings form. Along with the finding, the reviewer will document the date of the occurrence, the lab reference identification, the validation criteria, the associated samples, and the qualification of the data. A Validation Checklist form is marked noting if validation criteria was met or exceeded. A Validation Checklist is enclosed for review (Exhibit A). These checklists are used as an inventory sheet to assure all samples were reviewed for each criteria. The findings documented on the Validation Findings form will be transcribed into the final summary report. Examples of recalculation and findings worksheets used for Level 4 validation are available for review upon request.

All initial validation performed by LDC has a secondary peer review. All final reports will be reviewed by a Senior Chemist or Principal Chemist.

4) First Report Review

The first review of the data validation report verifies that all findings and data qualification has been accurately transferred from the data validation worksheets. All sample identifications, methods, formatting, and general text are reviewed.

5) Senior Report Review

The senior review of the data validation report verifies that all findings, data qualification, and professional judgments previously integrated into the reports reflect the overall quality of the data. Any additional comments required to enhance the usability of the report will be inserted at this time.

6) QA Report Review

A QA check of selected data validation reports within an individual delivery order will be reviewed by the QA department. A formal nonconformance report will be generated for any identified deficiencies. The deficiency will be addressed with the appropriate staff and corrected prior to submittal to senior management for final review and signature.

7) Senior Management Review

The program/technical manager will perform an overall review of the final reports. He will sign the report cover letter and submit the report to the sample custodian for shipment to the client.

8) Electronic Data Deliverables (EDD)

This process will be initiated at step 1 with the receipt of files from the client or loading EDDs to LDC's secured Internet portal. After automated verification of the EDD format, content, and fields, the EDD will be populated with the manual review for importing of the final data qualifiers. The final approval of qualifiers will occur after step 5.

LDC will self-perform the above tasks to maintain quality and control of the work product.

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Exhibit A

LDC #:____
SDG #:____
Laboratory:___

VALIDATION COMPLETENESS WORKSHEET

EPA Level IV

Date:_____
Page:_of_____
Reviewer:
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 8260B)
The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	/	
II.	GC/MS Instrument performance check		
III.	Initial calibration/ICV	/	
IV.	Continuing calibration		
V.	Laboratory Blanks		
VI.	Field blanks		
VII.	Surrogate spikes		
VIII.	Matrix spike/Matrix spike duplicates		
IX.	Laboratory control samples		
X.	Field duplicates		
XI.	Internal standards		
XII.	Compound quantitation RL/LOQ/LODs		
XIII.	Target compound identification		
XIV.	System performance		
XV.	Overall assessment of data		

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank
SB=Source blank
OTHER:

	Client ID	Lab ID	Matrix	Date
1				
2				
3				
4				
5				

Notes:

LDC Corporate Resources

LDC personnel have experience and formal training in the areas of data validation, electronic data deliverables and laboratory QA/QC. LDC personnel have performed data validation in all analytical disciplines. These include, but are not limited to, GC/MS volatiles, GC volatiles, GC/MS semivolatiles, GC pesticides, ICP metals, ICP/MS metals, GFAA metals, GC petroleum hydrocarbons, GC/MS dioxins, explosives, radiochemistry, and wet chemistry. This versatility allows our organization to adapt to workload changes and allows for an excellent secondary review system. Our organization is structured to allow direct communication between project managers, data validators, and clerical staff which occurs on a daily basis.

With LDC's 25+ years as a national leader in the data validation industry and extensive experience supporting projects with multiple EPA regions, DoD and DOE facilities, LDC is confident our data validation services will successfully meet all project requirements. The validation group is managed by Ms. Stella Cuenco, principal chemist, who has over 25 years of experience, the software products and services group is managed by Mr. Scott Denzer, who has over 35 years of experience, and the overall operations are directed by Mr. Michael Takaki, president.

The validation group is divided into chemists by discipline, organics (GC/MS, GC and HPLC) and inorganics (wet chemistry, IC, ICP, ICP/MS). All chemists report to senior group leads. A separate group performs data package log-in to the LDC tracking system. Another group performs the EDD population and verification. Christina Rink-Ashdown, Chemist and Project Manager, leads this group and has over 6 years of experience in EDD population, preparation, and uploading to various databases.

The majority of the data validation staff at LDC have been employed for over 10 years with some senior staff over 15 years as noted in the attached resumes. This level of stability and experience will ensure project stability and consistency.

In addressing LDC's financial status, LDC has an excellent Dun & Bradstreet report and has been profitable for the past 15 years. LDC has grown at approximately 10% in each of the past 5 years and continues to be a leader in our environmental sector of the data quality business. References are available from our vendors and clients to confirm our business success. Our annual revenue of approximately $6,000,000 per year in data validation work makes LDC one of the largest independent data validation firms in the nation. In 2001, Mr. Richard Amano was the San Diego SBA Small Businessman of the Year through our sponsor Earth Tech.

LDC will commit the resources and materials to successfully complete this project with the required time period and with a high level of quality.

Project Team Summary

LDC personnel have hands-on experience in the areas of data validation, laboratory QA/QC, CLP SOWs, and environmental laboratory analyses. As documented in the resumes of our staff, the project team has significant experience with USACE and DoD protocols, current technology, SW-846, and all methods stated in the SOW.

LDC is presenting the following staff to perform key roles for this contract. The key staff of the project team and their experience are as follows:

- **Stella Cuenco, Principal Chemist/Operations Manager**
  Project Role: Principal Chemist/Program Manager
  Data Validation Experience: 24 years
  Overall Laboratory and Data Validation Experience: 30 years
  B.S. Chemistry, University of the Philippines, 1991

  Ms. Cuenco has over 30 years of environmental laboratory and data validation experience under DoD and EPA guidelines. Her experience includes performance of data validation in gas chromatography/mass spectrometry for volatile and semivolatile organics and extensive Navy and EPA data review and data verification for all organic and inorganic analyses. Her laboratory experience includes hands-on CLP and SW-846 GC/MS methods.

- **Pei Geng, Senior Chemist/Project Manager**
  Project Role: Senior Organic Data Validator
  Data Validation Experience: 23 years
  Overall Laboratory and Data Validation Experience: 30 years
  M.S. Chemistry, Sam Houston University, 1989

  Ms. Geng will perform the role of organic data validator for this project. She will perform data validation for GC/MS and gas chromatography analyses and serve as a peer reviewer in the initial validation review process.

  Ms. Geng has over 30 years of environmental laboratory and data validation experience. Her experience includes performance of data validation in the gas chromatography area for volatile and semivolatile organics and extensive DoD data review and data verification for all organic analyses. Her laboratory experience includes hands-on CLP and SW-846 GC/MS methods.

- **Richard M. Amano, Principal Chemist**
  Project Role: Senior Technical Reviewer/Director
  Data Validation Experience: 29 years
  Overall Laboratory and Data Validation Experience: 41 years
  B.S. Biochemistry, UCLA, 1979

  Mr. Amano has over 40 years of environmental laboratory, QA/QC, and data validation experience. He has managed data validation projects using the DoD QSM data validation guidelines for the past twenty years. Prior to founding LDC in 1991, he directed two major laboratories, Analytical Technologies, Inc. and Brown and Caldwell, from 1983 to 1991. His data validation experience includes oversight and direction of major efforts for Superfund sites, DoE sites, Navy RI/FS projects, Army Corps of

Engineers investigations, and AFCEE/AFCEC projects. He also has overseen several laboratory audits for major analytical testing programs for the Navy, Texaco, and Hewlett-Packard. His laboratory experience includes hands-on CLP and SW-846 GC/MS analysis, direction of GC/MS (including TO-14 air analyses) and radiochemistry groups, dioxins method development, and complex GC data interpretation of Aroclors. He has performed expert witness support for litigation purposes.

- **Christina Rink-Ashdown, Inorganic Chemist/Project Manager**
  Project Role: Inorganic Data Validator/Project Manager
  Data Validation Experience: 11 years
  Overall Laboratory and Data Validation Experience: 13 years
  B.S. Biology, University of California, San Diego 2006

  Ms. Rink-Ashdown will perform the role of day to day Project Manager for this project. She will monitor schedules, compliance of validation to the Required Guidelines, perform routine surveillance activities such as generation of non-conformance reports, validator training and QA reports to management.

  Ms. Rink-Ashdown has over 13 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the trace metals, radiochemistry, and wet chemistry areas for major Federal and commercial projects. Her laboratory experience includes hands-on CLP and SW-846 ICP/CVAA analysis and overall technical review of data deliverables.

  Ms. Rink-Ashdown specializes in the data validation of radiochemistry, trace metals, wet chemistry, and methyl mercury and analyses under MARLAP and USEPA functional guidelines or equivalent protocol. Over the past two years, she has worked under various DoD, CERCLA and EPA data validation guidelines for the various CERCLA, Navy, Army Corps, AFCEE/AFCEC and commercial projects. She is also certified as a "Radiometric Data Validation Specialist" through course work and testing by the Radiochemistry Society.

- **Kevin Kha, Project Manager**
  Project Role: Project Management Assistance
  Data Validation Experience: 4 years
  Overall Laboratory and Data Validation Experience: 4 years
  B.A. Marine Sciences and Integrative Biology, UC Berkeley, 2014

  Mr. Kha has 4 years of data validation experience and specializes in the use of LDC Automated Data Review (ADR) software for validation, contract compliance screening, building eQAPPs libraries, and writing data validation reports (DVR) for projects utilizing ADR. He also builds eQAPPs and performs validation in the FUDSChem database, as well as data submission tasks in the ERPIMS database. He is also proficient in data validation for general chemistry and ICP/ICP-MS metals for Levels II through IV.

- **Tony Rommelfanger, Data Control Manager**
  Project Role: Data Custodian

  Mr. Rommelfanger will perform the role of data custodian for this project. He will perform the log-in of all data packages into the LDC tracking system. This system will generate spreadsheets for identifying all samples, their collection date, analysis performed,

matrix, and report due date. Upon the completion of each delivery order, he will archive and catalog all reports and data in a secured storage area.

Mr. Rommelfanger has over 28 years of experience in laboratory and data management experience. He has experience in organizing, logging in, and tracking data packages for technical staff.

Resumes of Key Staff

- Stella Cuenco, Senior Chemist
- Pei Geng, Senior Chemist
- Richard Amano, Principal Chemist
- Christina Rink-Ashdown, Inorganic Chemist
- Kevin Kha, ADR/EDD Specialist

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RESUME
STELLA S. CUENCO

EDUCATION

B.S. Chemistry, 1991
University of the Philippines (UP)

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Senior Chemist
1996 to present

Ceimic Corporation
GC/MS Chemist
1996

Analytical Technologies, Inc.
GC/MS VOA Group Leader
1992 to 1996

Analytical Technologies, Inc.
GC/MS Chemist
1991 to 1992

Natural Products Research, UP
Research Assistant
1990 to 1991

REPRESENTATIVE EXPERIENCE

Ms. Cuenco has over 30 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the GC and GC/MS areas for major Federal projects. She has performed large validation projects under Boeing, Navy Southwest, Northwest and Pacific Division, EPA Region IX ESAT, USACE and AFCEE/AFCEC programs. Her laboratory experience includes hands-on CLP and EPA analysis of GC and GC/MS volatile organic compounds.

Specifically, Ms. Cuenco has over 24 years organic data validation experience using USEPA (including Region III) functional guidelines and other applicable documents.

- As senior chemist with LDC, Ms. Cuenco specializes in the data validation and contract compliance screening of gas chromatography-mass spectrometry analyses as well as gas chromatography analyses. She has a thorough knowledge and understanding of gas chromatography and gas chromatography-mass spectrometry (GCMS) and high resolution GCMS methods referenced in EPA CLP, SW-846, EPA 500, 600 and 1600 series documents. She has performed large data validation under Boeing, Navy Southwest and Pacific Divisions and EPA Region IX ESAT, USACE and AFCEE/AFCEC projects.

Ms. Cuenco has over 6 years experience in an environmental laboratory performing the analysis of organic parameters.

- As GC/MS chemist at Ceimic Corporation, a full service environmental analytical chemistry facility, Ms. Cuenco performed GC and GC/MS volatile analyses. She was responsible for the final reporting of analytical data for this section.

- As GC/MS VOA Group Leader at Analytical Technologies Inc., a full service environmental analytical chemistry facility, Ms. Cuenco was responsible for all GC/MS functions which included overseeing daily operations, training staff, final reporting of analytical data, and compliance with method requirements.

- As research assistant at Natural Products Research, UP, Ms. Cuenco researched chemical literature for plants with known medicinal properties as well as performed microbiological and pharmacological tests on plant extracts.

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RESUME
PEI GENG

EDUCATION

M.S. Organic Chemistry, 1989
Sam Houston State University

B.S. Environmental Chemistry, 1983
Nankai University

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Senior Chemist
1997 to present

Ceimic Corporation
GC/MS and GC Chemist
1996 to 1997

PACE Analytical Service Inc.
GC/MS and GC Chemist
1990 to 1996

REPRESENTATIVE EXPERIENCE

Ms. Geng has over 30 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the GC and GC/MS areas for major Federal projects. She has performed large validation projects under Boeing, Navy Southwest, Northwest and Pacific Division, EPA Region IX ESAT, USACE and AFCEE/AFCEC programs. Her laboratory experience includes hands-on CLP and EPA analysis of GC and GC/MS volatile organic compounds.

Specifically, Ms. Geng has over 23 years organic data validation experience using USEPA CLP (including Region III) functional guidelines and other applicable documents.

- As chemist with LDC, Ms. Geng specializes in the data validation and contract compliance screening of gas chromatography-mass spectrometry analyses as well as gas chromatography analyses. She has a thorough knowledge and understanding of gas chromatography and gas chromatography-mass spectrometry (GCMS) and high resolution GCMS methods referenced in EPA CLP, SW-846, EPA 500, 600 and 1600 series documents. She has performed large data validation under Boeing, Navy Southwest and Pacific Divisions and EPA Region IX ESAT, USACE and AFCEE/AFCEC projects.

Ms. Geng has over 7 years of experience in an environmental laboratory performing the analysis of organic parameters.

- As both a GC and GC/MS chemist at Ceimic Corporation, a full service environmental analytical chemistry facility, Ms. Geng performed GC and GC/MS volatile and semivolatile analyses.

- As both a GC and GC/MS chemist at PACE Analytical Service Inc., a full service environmental analytical chemistry facility, Ms. Geng performed GC and GC/MS volatile and semivolatile analyses as well as overseeing the final reporting of analytical data, and compliance with method requirements.

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RESUME
RICHARD M. AMANO

EDUCATION

B.S. Biochemistry
University of California, Los Angeles, 1979

A.A. Chemistry
El Camino College, 1977

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Program Manager/Principal Scientist
2011-present
President/Principal Chemist,
1991 to 2011

Analytical Technologies, Inc
Laboratory Director
1986 to 1991

Brown & Caldwell
Laboratory Supervisor
1983 to 1986

West Coast Technical Service
Senior Chemist
1980 to 1983

University of California, Los Angeles
Laboratory Technician
1979 to 1980

REPRESENTATIVE EXPERIENCE

Mr. Amano has over 41 years of combined environmental laboratory, QA/QC, laboratory auditing, data management, environmental software development, and data validation experience. Prior to founding LDC in 1991, he directed to two major laboratories, Analytical Technologies, Inc. (San Diego) and Brown and Caldwell. His experience includes oversight and direction of major QA/QC and data validation efforts for confidential petroleum spill projects, Boeing sites, Superfund sites, DoE sites, Navy RI/FS projects, Army Corps of Engineers investigations, and AFCEE/AFCEC projects. He has also overseen several laboratory audits for major analytical testing programs and large scale environmental software development for the US Army Corps of Engineers (USACE).

Specifically, Mr. Amano has over 29 years of experience with validation of organic, inorganic, and radiochemical analyses using USEPA, Navy, USACE, DoD, AFCEE/AFCEC, and other applicable guidance documents.

- As program manager/principal scientist with LDC, Mr. Amano provides management and technical support to the data validation, data quality, and software group. He oversees and directs all environmental software projects developed for the USACE. Additionally, he acts as the primary LDC/USACE contract manager for software development projects. He is the primary author of the nationally distributed Automated Data Review (ADR) software used by the USACE, Navy, DTSC, and commercial clients.

- As President/principal chemist with LDC, Mr. Amano provided management and technical support to the data validation, data quality, and software group. He provided technical support in the organic, inorganic, and radiochemical areas. Under several major QA/QC and data validation programs, he provided, as needed, a final review of data validation and assessment reports. Mr. Amano specializes in the evaluation, validation, and interpretation of environmental testing data. Additional responsibilities include laboratory QA/QC and NELAC audits, implementation and support of QA/QC programs and data management support for engineering firms, environmental lab training, consultation on LIMS data base designs for environmental laboratories, and expert witness litigation support. Mr. Amano has managed and directed several major data validation and QA/QC projects for Army Corps, Navy, Air Force, and commercial contracts. Industrial projects include major petroleum oil spill related data validation and assessment of hydrocarbon analyses. The DoD projects include Southwest Division CLEAN 1 (Jacobs Engineering/IT Corporation/CH2M Hill), Southwest Division CLEAN 2 (Bechtel National), Pacific Northwest Division CLEAN (URS Greiner), Southern Division CLEAN (ABB Environmental), Atlantic Division CLEAN (EA Engineering), Southwest Division RAC (OHM Remediation), Pacific Division CLEAN (Earth Tech), AFCEE/AFCEC Mather AFB (Montgomery Watson), AFCEE/AFCEC Pease AFB (Bechtel Environmental), AFCEE/AFCEC England AFB (Law Environmental), Army Corps Travis AFB (CH2M Hill), Army Corps Hawthorne Army Depot (Tetra Tech), Nevada Test Site (IT Corp), and Army Corps Fort Ord (Harding Lawson). He provided oversight and direction for major USACE environmental software development including Automated Data Review (ADR), FUDSFORUM, MRSPP, and FUDSCHEM. He has a thorough knowledge and understanding of EPA CLP, SW-846, EPA 500, EPA 900, and EPA 600 series methods. He additionally has supported attorneys as an expert witness and has taught data integrity and lab ethics courses for several organizations.

Mr. Amano has over 12 years environmental laboratory experience in commercial laboratories supervising or performing the analyses of organic, inorganic, and radiochemical parameters.

- As laboratory director and technical director of Analytical Technologies, Inc, a full service environmental analytical chemistry facility, Mr. Amano was responsible for all facets of operations. These responsibilities include direct technical input for GC, GC/MS, and inorganic operations, personnel selection, assisting in method development, and selection of non-routine analysis. In addition, Mr. Amano was responsible for supervision of the 80 scientists employed at ATI's San Diego laboratory with all group supervisors, quality assurance and safety coordinators reporting directly to him. Mr. Amano has managed numerous analytical testing programs including the North Island Navy Confirmation Study, Miramar Air Force Base Confirmation Study, and investigations at several of the EPA Superfund sites. His environmental expertise focuses on the chemical testing related to hazardous waste investigations, site remediation, and groundwater monitoring programs.

- While at Brown & Caldwell, Mr. Amano's responsibilities encompassed supervision of daily operations of the laboratory, personnel staffing, technical advisor for operation of the gas chromatograph/mass spectrometer (GC/MS) section, maintenance of QA/QC programs, and coordination between engineers, clients, and laboratory analysts. Additionally, he supervised the daily operation of all radiochemistry activities which included alpha, beta, and radium analyses.

- At West Coast Technical Service, Mr. Amano was responsible for daily operation and quality control of the GC/MS group. Mr. Amano was highly involved with the USEPA hazardous waste contracts. Some special projects included dioxin selected ion monitoring analysis, EPA method 624 and 625 validation studies, and low level drinking water evaluations.

TECHNICAL PRESENTATIONS

"Understanding the Workings of an Environmental Laboratory"
Southern California Department of Health Services, 1984
Hargis & Associates, Inc, La Jolla, CA, 1987
Hargis & Associates, Inc, Tucson, AZ, 1987
Westec Services, San Diego, CA, 1987
Applied Hydrogeologic, Inc, San Diego, CA 1989

"Data Validation, QA/QC, and Environmental Analysis"
Van, Waters, and Rogers, Seattle, WA, 1990
ERC Environmental, Honolulu, HI, 1991
Harding Lawson Associates, Honolulu, HI, 1991
Pacific Division Naval Engineering Group, Honolulu, HI, 1991
OHM, Irvine, CA, 1996
Southwest Division Naval Engineering Group, San Diego, CA, 1996
Navy Public Works Center, San Diego, CA 1996

"GC versus GC/MS"
J.H. Kleinfelder & Associates, Artesia, CA 1986
Hargis & Associates, Inc, La Jolla, CA 1987

"Analytical Methods and QA/QC Procedures for Environmental Analysis"
County of San Diego Department of Health Services, San Diego, CA 1989
Regional Water Quality Control Board, San Diego, CA 1990
ERC Environmental, San Diego, CA 1990
Mittlehauser Corporation, Laguna Hills, CA 1991

"Hydrocarbon Testing Related to Underground Storage Tanks (UST)"
San Diego County DOHS, San Diego, CA, 1986
J.H. Kleinfelder & Associates, Artesia, CA 1986
Woodward Clyde Consultants, San Diego, CA 1987

Engineering Enterprises, Long Beach, CA 1987

"Quality Control/Quality Assurance in Laboratories"
Assoc of Hazardous Materials Professionals, Anaheim, CA 1986
R.L. Stollar & Associates, Santa Ana, CA 1989

"The Influence of Sample Matrix on Environmental Analysis"
Assoc of Hazardous Materials Professionals, San Diego, CA 1990

"Comparison of Air Sampling Media"
Assoc of Hazardous Materials Professionals, Anaheim, CA 1991

"Building a Second Generation LIMS for Commercial Laboratory Operations"
Pittsburgh Conference, New York, NY, 1990 (Invited Speaker)

"Employment Outlook in Environmental Laboratories"
Southern California American Chemical Society, 1985

"Opportunities in the Environmental Lab in the 1990's"
American Chemical Society, 1990

"Data Validation of Radiochemical Analyses"
Hargis + Associates, La Jolla, CA 1991

"Detection Limits - MDL, PQL, RDL, LOD ?"
Analytical Technologies, Inc., 1991

"Poor QA/QC or Laboratory Fraud: Have labs crossed the fine line?"
Environmental Professionals Organization, Newport Beach, CA 1996

"Electronic Data Deliverables and Automated Data Review/Validation"
Army Corps of Engineers, Sacramento District, Sacramento, CA 1996

"Navy Environmental Data Transfer Standards"
Kleinfelder, San Diego, CA 1997

"Laboratory QA/QC Update for DoD Programs"
ACTLabs, Long Beach, CA 1997

LECTURING AND TEACHING

"Instrumental Analysis of Hazardous Materials"
University of California, San Diego 1988 - 1995

"Field Monitoring & Laboratory Analysis of Hazardous Materials"

University of California, San Diego 1995 - 1998

California State Fullerton, Guest Lecturer, 1985 & 1990

San Diego State University, Hydrology Department, Guest Lecturer, 1988

"EPA Level 4 Data Validation" Workshop
Applied Geotechnology, Inc., Bellevue, WA, 1993

"Environmental Analyses in the 90's"

National University, Guest Lecturer, 1993

"Data Quality Objectives for Federal Environmental Programs"
University of California, San Diego 1993

"Data Integrity and Data Management for Federal Environmental Programs"
University of California, San Diego 1994

"Laboratory QA/QC and Electronic Data Requirements for DoD Programs"
University of California, San Diego 1995

"Application and Utilization of Department of Defense (DoD) Guidance Documents"
University of California, San Diego 1996

"Laboratory Quality Assurance for Department of Defense Programs"
University of California, San Diego 1997

PUBLICATIONS

"Managing an Environmental Chemistry Laboratory for Profit",
John H. Taylor, Jr and Richard M. Amano,
Journal of Chromatographic Science, 1987

MEMBERSHIPS AND AFFILIATIONS

American Chemical Society
Association of Hazardous Materials Professionals, (Steering Committee 1988-1994)
Association of California Testing Laboratories, (Board Member 1989-1991)
County of San Diego, Site Assessment and Mitigation Technical Forum (Steering Committee 1990-2000)
American Society Quality Control (1992-2005)

FOUNDATIONS

Golf for Autistic Children in America (GACA), Founder/President (2011)

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RESUME
CHRISTINA RINK-ASHDOWN

EDUCATION

BS Biology, 2006
University of California, San Diego

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Inorganic Chemist
2009 to present

Enviromatrix Analytical, Inc.
Metals Chemist
2007 to 2009

REPRESENTATIVE EXPERIENCE

Ms. Rink-Ashdown has over 13 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the trace metals, radiochemistry, and wet chemistry areas for major Federal and commercial projects. Her laboratory experience includes hands-on CLP and SW-846 ICP/CVAA analysis and overall technical review of data deliverables. Specifically, Ms. Rink-Ashdown has over 6 years inorganic and radiochemistry data validation experience using USEPA (including Region III) functional guidelines and other applicable documents.

As chemist with LDC, Ms. Rink-Ashdown specializes in the data validation of trace metals, wet chemistry, methyl mercury and radiochemistry analyses using USEPA functional guidelines or equivalent protocol. She has worked under various CERCLA and EPA data validation guidelines for the various CERCLA, Navy, Army Corps, AFCEE/AFCEC and commercial projects. She is certified as a “Radiometric Data Validation Specialist” through course work and testing by the Radiochemistry Society. **Ms. Rink-Ashdown has validated over 2,000 samples for various isotopes in the last two years.**

Ms. Rink-Ashdown has over 2 years of environmental laboratory experience in a laboratory performing the analyses of inorganic parameters.

As lead inorganic chemist at Enviromatrix Analytical, Inc., Ms. Rink-Ashdown managed the inorganic chemistry section which performed techniques such as atomic absorption and inductively coupled argon plasma spectrometry. These analyses were performed from methods referenced in EPA CLP, SW-846, and Standard Methods documents.

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RESUME
KEVIN KHA

EDUCATION

B.A. Marine Sciences and Integrative Biology, 2014
University of California, Berkeley

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Project Manager (ADR/EDD Specialist and Inorganic Chemist)
2016 to present

REPRESENTATIVE EXPERIENCE

Mr. Kha has five years of experience ranging from validating electronic data deliverables (EDDs) through Automated Data Review (ADR) software, to manual data validation of trace metals, general chemistry, and radiochemistry, as well as submission of data and reports to various environmental chemistry databases.

As the ADR/EDD specialist with LDC, Mr. Kha has completed over 1,500 data validation reports utilizing ADR software. His experience also includes the creation of numerous eQAPPs for LDC's ADR and FUDSChem ADR. He has also submitted data and validation reports for various FUDS, AFCEE/AFCEC, and commercial projects to databases like FUDSChem and ERPIMS. Mr. Kha has 3 years of data validation experience of trace metals, general chemistry, and radiochemistry in accordance with USEPA functional guidelines and DOD QSM for Stages 2a through Stage 4 validation.

As a project manager with LDC, Mr. Kha assists the other project managers through project set-up, validation, report review, and writing project data quality assessment reports.

Relevant Project Experience

LDC has performed data validation and Quality Assurance services for contaminated sites overseen by AFCEE/AFCEC, Navy Southwest Division, DoE, DoD, EPA Superfund projects overseen by EPA Regions II, III, IV, IX, X, USACE projects reviewed by the Alaska, Baltimore, Louisville, Albuquerque, Seattle, Philadelphia, and Sacramento Districts, and Navy projects reviewed by NFESC.

LDC is the software developer and expert in the use of the Automated Data Review (ADR) software. LDC has been using the ADR.NET version and has the current Version in full implementation. LDC has performed over 1000 ADR projects in the past 10 years' worth over $2,000,000 in revenue. ADR clients include, but are not limited to: Tetra Tech EC, Sealaska, AMEC, EPA, California DTSC, MWH, Trevet, Brown & Caldwell, AECOM, Shaw, ITSI, CDM, Weston Solutions and the San Gabriel Watermaster.

LDC has validated over 1,000,000 samples for analyses such as volatile organics (CLP, EPA Method 8240/8260), semivolatile organics (CLP, EPA Method 8270), organochlorine pesticides/PCBs (CLP, EPA Method 8081/8082), chlorinated herbicides (EPA Method 8151), purgeable halocarbons and aromatics (EPA Method 8021), trace metals (CLP, EPA Method 6010/6020/7000), PAHs by EPA 8310 and 8270,TOC analyses, hexavalent chromium, total petroleum hydrocarbons (EPA Method 8015/CDOHS LUFT), radiochemical constituents including gross alpha/beta, alpha spec, gamma spec, tritium, and uranium, and general minerals.

LDC has met their contractual turnaround time and quality requirements on over 99% of the projects completed.

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Project References/Experience

Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value ($)	Start/Stop
EA Engineering 225 Schilling Circle Hunt Valley, MD 21031 Project Manager ATTN: Ms. Brenda 615 Piikoi Street, Honolulu, HI 96814 Office: (808) 589-1455, x102 Fax: (808) 589-1575 Mobile: (808) 256-8268 E-mail: bnuding@eaest.com Nudingbnuding@eaest.com	Fairchild AFB LDC performed Stage2B and 4 data validation for PFAs and Wet Chemistry analyses and EDD population.	Stage 2B and 4 data validation reports. Work conducted under Working Copy Quality Assurance Project Plan for Environmental Remediation Services FAFB and PFAS Fairchild Air Force Base, Spokane County, Washington (July 2019) and the USEPA Data Review and Validation Guidelines for Perfluoroalkyl Substances (PFAS) Analyzed Using EPA Method 537 (November 2018).	>400 Water	$6,727	08/2019-present
Cape Inc. 500 Pinnacle Court, Suite 100 Atlanta, GA 30071 ATTN: Mr. Wayne Vermeychuk wvermeychuk@cape-inc.com Office: 727.940.4713 Mobile: 678.492.9384	Mather AFB LDC performed Level II and IV data validation for a full suite of analyses including GCMS, GC, Metals, and Wet Chemistry analyses and ERPIMS EDD Upload.	Level II and IV data validation reports. Work conducted under Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Environmental Services for Western Region Base Realignment and Closure (BRAC) Bases, Mather Air Force Base (AFB), California (February 2017), the DoD QSM 5.2 (2018), and a modified outline of the USEPA NFG.	>1700 Water and Air	$55,142	02/2017-present

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Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value ($)	Start/Stop
Ayuda Companies 410 Acoma Street Denver, CO 80204 ATTN: Susan Royse Office: 303.999.2146 Fax: 303.999.2099 sroyse@ayudacompanies.com	Various Omaha AFB Sites LDC performed Level III and IV data validation for a PFAs analyses and ADR and SEDD population, and ERPIMS EDD Upload.	Level III and IV data validation reports. Work conducted under Addendum 3 to the Final Uniform Federal Policy – Quality Assurance Project Plan for Site Inspection of Aqueous Film-Forming Foam Areas, United State Air Force Academy (July 2018), the DoD QSM) 5.1 (2017), and the DoD General Validation Guidelines (February 2018).	>360 Water and Soil	$8434	02/2017-present
Washington State Department of Transportation Environmental Services Office P.O. Box 47332 Olympia, WA 98504 ATTN: Mr. Brad Archbold ArchboB@wsdot.wa.gov 360-570-6636	WSDOT NPDES Stormwater Monitoring LDC performed Stage2A, 2B and 4 data validation for a full suite of analyses including GCMS, GC, Metals, and Wet Chemistry analyses.	Stage 2A, 2B, and 4 data validation reports. Work conducted under Washington State Department of Transportation Stormwater Monitoring	>3,800 Soil and Water	$48,332	04/2013-07/2016
Leighton Consulting, Inc. 17781 Cowan Irvine, CA 92614 ATTN: Mr. Mark Withrow mwithrow@leightongroup.com cell: 949-394-2194 office: 949-681-4211	San Onofre Nuclear Generating Station (SONGS) Mesa Facility LDC performed EPA Level III and IV equivalent data validation for a full suite of analyses. Analyses included GCMS, GC, Metals, and Wet Chemistry analyses.	EPA Level III and IV data validation reports. Work conducted under USEPA Contract Laboratory Program National Functional Guidelines (CLPNFG).	>3,600 Soil, Water, and Air	$149,714	09/2015-present
Leighton Consulting, Inc. 17781 Cowan Irvine, CA 92614 ATTN: Ms. Julie Harriman jharriman@leightongroup.com Direct : (949) 681-4264 Cell: (949) 572-8129	Aliso Canyon LDC performed EPA Level II equivalent data validation. Analyses included VOA, SVOA, Total Hydrocarbons, Isopropyl Alcohol, Total Dust, and Sulfur Compounds.	EPA Level II data validation reports and PARCC summary report. Work conducted under USEPA Contract Laboratory Program National Functional Guidelines (CLPNFG).	>1,200 Air, Wipe, and Disk	$15,749	07/2016-08/2016

Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value ($)	Start/Stop
Tetra Tech, EM Inc. 1999 Harrison Street, Suite 500 Oakland, CA 94612 ATTN: Ms. Sara Woolley Sara.Woolley@tetratech.com Direct: 510.302.6311 Main: 510.302.6300	Subcontract 161408 For Various project sites including: EAGLE NEST INVESTIGATION FORT IRWIN GOLD BEACH MILL HPNS MARE ISLAND MOTCO LITIGATION NAF EL CENTRO NWS CONCORD LDC performed Cursory and Full data validation for a full suite of analyses using specified EPA Guidelines, DoD QSM Version 4.2, and Tetra Tech EMI, Inc. validation documents.	TTEMI Format data validation reports and EDD using Tetra Tech's validate program.	>3000 Soil and Water	$39,785	10/2011 – 10/2013
GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5342 direct (860) 368-5300 main Jaimie Wargo JWargo@geiconsultants.com	Various NYSDEC sites LDC performed Category B equivalent data validation Analyses included: VOC, SVOC, Pesticide, PCB, Herbicide, Steroids, Metals, Wet Chemistry	Category B data validation and NYSDEC DUSR reports	>1,700 Soil and Water	$72,000	2010-present
TetraTech EC 17885 Von Karman Ave, Suite 500 Irvine, CA 92614 Attn: Lisa Bienkowski (949) 809-5028 Lisa.Bienkowski@tetratech.com	Tetra Tech Hunter's Point CA LDC performed EPA Level III and IV equivalent data validation for a full suite of analyses on more than 50,000 soil and water samples. Analyses included tritium, isotopic thorium, uranium and plutonium, and gross alpha/beta. Expedited turnaround times were included (5 day TAT)	EPA Level III and IV data validation reports. Work conducted under US Navy RAC program, Southwest Div.	>50,000 Soil and Water	$645,733	02/2001-present
AECOM (Earth Tech) 700 Bishop Street Honolulu, HI 96813 Contact: Scott Lewis (808) 523-8874 Scott.Lewis@aecom.com	Data validation per EPA level "3/C" and "4/D" guidelines for volatile organic, semivolatile organic, pesticides/PCBs, herbicides, phenols, phosphorus pesticides, dioxin, radiochemical, and trace metal analyses in soil, water, and tissue matrices. (Navy PACDIV CLEAN, Honolulu, HI)	LDC worksheets and validation reports	>10,000 samples Water/Soil/Air	$750,000	4/98-present

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Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value ($)	Start/Stop
CBI (formerly Shaw E&I) 3347 Michelson Drive, Ste 200 Irvine, CA 92612 Contact: Mr. Dwayne Ishida Phone: (949) 660-7561 Dwayne.Ishida@CBIFederalServices.com	Data validation per EPA level "3" and "4" and AFCEE/AFCEC guidelines for volatile organic, semivolatile organic, pesticides/PCBs, herbicides, phenols, phosphorus pesticides, dioxin, radiochemical, and trace metal analyses in soil, water, and tissue matrices. (Navy Southwest Division RAC, San Diego, CA and various AFCEE/AFCEC projects)	LDC worksheets and validation reports	>5000 samples Water/Soil/Air	$350,000	6/06-present
Santa Clara Pueblo Office of Environmental Affairs 578 Kee Street Espanola, New Mexico, 87532 Ms. Ernestine Naranjo 505-692-6270 phone 505-747-2728 fax enaranjo@santaclarapueblo.org	Data validation per EPA level "III" SCP-OEA-DEPO, Data Validation using ADR For full suite of Organic, Inorganic, and Radiochemical analyses. Radiochemical analyses including Gross alpha & beta, Gamma Spectroscopy, Iodine, Radium-226/228, Strontium-90, Isotopic Pu, Th, and U, Tritium, and Americium by various EPA and GA methods.	Level III validation using ADR	>2000 Soil, Water, and Air	$78621	12/2015 - present
Anchor Environmental, LLC 720 Olive Way, Suite 1900 Seattle, WA 98101 Ms. Joy Dunay 206.287.9130, jdunay@anchorqea.com	Data validation per Level “C” Newtown Creek Phase 2: Third Party Data Validation of laboratory results, EDD population, and Data Quality Assessment Reports (DQAR) for various methods Subcontractor	LDC worksheets and validation reports	>63,000 Soil and Water	$743,793.88	6/14-1/16
P.W.Grosser Consulting2015 630 Johnson Ave, Suite 7 Bohemia, NY 11716 Attn: Mr. Derek Ersbak w. 631.589.6353 f. 631.589.8705 dereke@pwgrosser.com	Former Arkansas Chemical Co.Site and Former Ronkonkoma Wallpaper Site 203 Jay St. LDC performed Category B equivalent data validation Analyses included: VOC, SVOC, Pesticide, PCB, Metals, Wet Chemistry	Category B data validation and NYSDEC DUSR reports	>200 Soil and Water	$3,024.00	11/2014-present
Amec Foster Wheeler Environment and Infrastructure, Inc. 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Attn: Mr. Rolf Schottle rolf.schottle@amecfw.com Tel +1 (858) 300 4300, Fax +1 (858) 300 4301, Direct +1 (858) 300 4323	Regional Harbor Monitoring Program (RHMP), San Diego, California Third party validation of LDC performed EPA Level III and IV equivalent data validation for a full suite of analyses.	LDC worksheets and validation reports	>200 Water	$9,011.40	3/15–6/16

Note: All above projects were 100% self-performed by LDC

ATTACHMENT 2

Standard Operating Procedures, Laboratory Detection Limits for Emerging Contaminants and NYSDEC Guidance for Sampling Emerging Contaminants

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

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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.

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

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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/LCSD 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°C for 0.5 minutes
Column Temperature Program: 140° to 320°C at 22°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

$$\text{Concentration (µg/KG)} = \frac{(As)(Cis)(D)(Vt)}{(Ais)(RF)(Ws)\,(Vi)\,(1000)}$$

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	09/28/2020
Don Dawicki Date	Ryan Hammond Date
Laboratory Director	Operations Manager / EHS Coordinator
09/28/2020	09/28/2020
Kristine Dusablon Date	Mark Fausel Date
Quality Assurance Manager / Technical Manager	Department Supervisor

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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.

$$Mass_{acid} = Measured\ Mass_{salt} \times MW_{acid} / MW_{salt}$$

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)	[redacted]
Collision Cell Exit Potential-CXP (volts)	[redacted]

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	[redacted]			
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 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			

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		

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 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 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 F

Resumes of Key Personnel

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

Sixteen 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 ongoing 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.

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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.

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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

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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

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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.

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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.

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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

Over five 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

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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.

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ROUX

PROFESSIONAL PROFILE

David E. Kaiser, P.E.
Senior Engineer

TECHNICAL SPECIALTIES

Engineering services including development and review of design drawings, implementation of design, development of technical specifications, review of construction submittals, development of SWPPPs, field management and site safety of various heavy construction projects, and civil/remediation engineering construction management. Designs have included stormwater drainage systems, NYCDEP sewer system, NYCDOB/DOT sidewalk project, and remedial system design. Additional services including budget management, permitting, project coordination, project scheduling, development of bid packages and cost estimating.

Field management and construction oversight of heavy equipment construction including sewer construction, drainage construction, crane lift activities and remedial construction activities. Environmental site assessments focusing on soil, soil vapor, groundwater and excavation dewatering investigations.

EXPERIENCE SUMMARY

Twelve years of experience: Project Engineer with Roux Environmental Engineering & Geology, D.P.C.; Design Engineer with Bohler Engineering.

CREDENTIALS

B.E. Civil Engineering, Hofstra University, 2006
Fundamentals of Engineering E.I.T. Certification, 2006
Professional Engineer (NY), 2017
OSHA 40-Hour HAZWOPER Training, 2008
OSHA 30-Hour Construction Safety Training, 2011
OSHA 10-Hour Construction Safety Training, 2018
OSHA 8-Hour Hazardous Waste Refresher Training, 2017
LPS 8-Hour Training Certification, 2008
First Aid and CPR Certified, 2016
DOT Hazardous Materials Awareness Training, 2017
NYSDEC Erosion and Sediment Control Training, 2016
Transportation Worker Identification Credential (TWIC)

KEY PROJECTS

- Land Development Site Plan Preparation – Design Engineer for the design and development of residential, commercial and industrial site plan packages for Suffolk County, Nassau County and New York City Boroughs. Site plan packages for the various municipalities within Suffolk County, Nassau County and New York City included components such as: zoning analysis, site removals plan, site design and construction documents, water and sewer system design (detention and retention systems), site grading and drainage plans, and lighting analysis and design.
- Suffolk County Drywell Closure – Senior Engineer for the planning and coordination of closing existing drywell structures serving as sanitary and industrial retention basins for an industrial facility. The project consisted of developing a sampling plan for the site, coordinating sampling and inspection of existing sanitary and industrial drywells in accordance with Suffolk County Department of Health Services Article 12, SOP No. 9-95 Pumpout and Soil Cleanup Criteria. Following the sampling event, a summary of results was prepared and sent to the SCDHS for review. Due to exceedances that were present within the septic tanks, a remedial action work plan was developed to identify the required steps for successful closure, which included coordinating the SCDHS field inspection, extraction of contaminated liquids and solids, and proper disposal of the waste.
- Property Drainage System Design and Construction – Project Engineer for the design and development of a new on-site stormwater treatment system located at a former petroleum terminal in Brooklyn, NY. Design included drainage improvements and modifications for the former petroleum terminal to support ongoing remediation activities that were being conducted to facilitate the future closure of an existing in-ground oil/water separator and removal of associated piping, and to support the anticipated long-term remedy for, and potential future redevelopment of the subject property. The proposed drainage modifications included the installation of new drainage structures, Contech treatment structures and conveyance piping to collect and treat stormwater runoff within the property and bypass the existing in-ground oil/water separator, prior to discharging the stormwater via an existing SPDES outfall.
- Oil/Water Separator Closure – Project Engineer for engineering support and review for the closure of an existing in-ground oil/water separator at a former petroleum terminal in Brooklyn, NY. The closure and abandonment of the oil/water separator was deemed the long-term remedy as approved by the NYSDEC. The oil/water separator was originally constructed in the early 1900s and has served the property by providing stormwater runoff treatment. The closure project includes the following tasks: dewatering and treatment of separator water; excavation of existing sludge in separator; dewatering and drying/stabilization of the sludge removed; power washing of interior; backfill and compaction of clean fill inside separator; removal of all existing above-grade structures including catwalks, guardrails, and piping; proper shipping and disposal of sludge contents; installation of a final cover system consisting of a geosynthetic clay liner (GCL) and filter fabric barrier; and final site grading.
- Treatment System Building Upgrades – Project Engineer for the review and implementation of engineering drawings for a metals removal system

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Senior Engineer

upgrade to an existing 450-gpm groundwater treatment system. The upgrades consisted of: relocating and reinstalling the existing oil/water separator tank on a steel spacer via crane; lifting and installing the existing 10,000 gallon equalization tank to be repurposed as a filter backwash solids removal tank; lifting and installing prefabricated concrete pads with a subbase of Geogrid BX1200 and 6" of aggregate size number 57 (as per NYCDDC Highway Specifications and ASTM C33) compacted to 95% Standard Proctor, under proposed tank locations; locating a new 20,000 gallon equalization/aeration tank on the new pad; installing of new blower motor and enclosure; and installing of new piping and appurtenances.

- NYCDEP Private Storm and Sanitary Sewer System – Project/Staff Engineer for the design and development of a New York City Department of Environmental Protection (NYCDEP) Private Storm and Sanitary Sewer System located at a former petroleum terminal in Brooklyn, NY. The sewer system comprised of over 2,600 LF of sewer in Greenpoint, Brooklyn over two phases of construction. During the duration of this project, responsibilities included: develop/revise NYCDEP sewer design plans and construction notes, address NYCDEP comments and markups, develop Bill of Materials, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDEP and NYCDOT specifications and requirements, develop/revise NYCDOT Builder's Pavement Plan (BPP), develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, review subcontractor submittals and cut sheets, address NYCDEP punch list items, and management/oversight/coordination of subcontractor construction activities.
- NYCDOB/NYCDOT Sidewalk Installation – Project/Staff Engineer for the design, development, and installation of over 4,000 linear feet of new sidewalks over various phases located at a former petroleum terminal in Brooklyn, NY. The design, development, and installation of these sidewalks were in accordance with the New York City Department of Buildings and New York City Department of Transportation specifications and details of construction. During the duration of these projects, my major responsibilities included: develop/revise NYCDOT Builder's Pavement Plans, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDOB and NYCDOT specifications and requirements, develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, ensure proper installation and testing of sidewalks in accordance with NYCDOB and NYCDOT, and management/oversight/coordination of subcontractor construction activities.
- Sub Slab Depressurization System – Staff Engineer for the design and construction of two sub slab depressurization systems (SSDS) located within the footprint of a petroleum remediation site where a new building was proposed to be built. These projects were part of an Interim Remedial Measure (IRM) Action Plan as approved by the NYSDEC to provide a preventative proactive measure to address potential soil vapor issues. The SSDSs were designed to operate passively; however, header piping was installed to allow for the installation of the necessary equipment if an active system was required. The SSDSs consisted of ¾-inch gravel with 4-inch diameter polyvinyl chloride (PVC) schedule 40 well screen used as soil gas collection piping and 6-inch diameter solid PVC used as the header piping. A vapor barrier/waterproofing membrane and nonwoven geotextile fabric were installed between the venting layer and the floor slab. All penetrations through the floor slab were sealed using a silicone-based waterproof sealant. The scope of work included excavation and trench work for the SSDS; placement of pipe bedding; jointing and installation of the pipe fittings, valves and appurtenances; installation of pipe sleeves and mechanical seals; and installation of nonwoven geotextile fabric and silicone-based waterproof sealant.
- Stormwater Pollution Prevention Plan (SWPPP) Reports – Staff Engineer for preparing and submitting Stormwater Pollution Prevention Plans (SWPPP) for various residential and commercial development sites in New York City and Long Island. The scope of work included preparation of SWPPP Reports in accordance with the most current New York State Department of Environmental Conservation (NYSDEC) regulations at the time, including the 'General Permit for Stormwater Discharges from Construction Activity' and the 'New York State Stormwater Management Design Manual'. Preparation of the SWPPP Reports included: summarizing the site history and project description, soil geology, potential pollutants, erosion and sediment control practices, inspection and maintenance procedures, water quantity and water quality control plans, construction sequence scheduling, and the Notice of Intent (NOI) for each project as required by the NYSDEC.

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LDC Company Profile

LDC is a small, minority-owned (SBE/MBE) quality assurance and environmental chemistry company focused on data validation, data quality assessment, database implementation, and data usability. Our primary services include data validation, electronic transfer of data, oversight of quality assurance/quality control (QA/QC) programs, laboratory and field audits, technical support for litigation, and database management. Our corporate office located in Carlsbad, California is directed by Mr. Scott Denzer and Ms. Stella Cuenco, principal chemists with over 45 years of experience between them in the environmental laboratory and data validation industries

LDC is recognized as one of the leaders in the data validation industry through participation on major DoD and commercial projects such as:

- Army Corps of Engineers, DuPont Chambers (Baltimore District)
- Army Corps of Engineers, DuPont Chambers (Philadelphia District)
- Army Corps of Engineers, Various projects (New Mexico)
- Army Corps of Engineers, Camp Navajo (Tetra Tech)
- Army Corps of Engineers, Various projects, 8a Contract (Sacramento District)
- Army Corps of Engineers, Fort Ord (Shaw E&I)
- Las Vegas Wash Henderson Site (ERM)
- DOE NPR-1 Elk Hills (DOE direct and Ahtna)
- Nevada Environmental Response Trust (NERT) Henderson Site (Ramboll Environ)
- NOAA MDRA Mississippi Site (Entrix)
- Stringfellow Superfund Site (DTSC)
- BKK Landfill (Ramboll Environ)
- EPA Region IX ESAT QA Program (ICF)
- AFCEE/AFCEC, Andersen AFB (EA/Shaw)
- AFCEE/AFCEC, Loring/Pease AFB (Bechtel/MWH)
- AFCEE/AFCEC, Mather AFB (MWH)
- AFCEE/AFCEC, Army Corps of Engineers, Travis AFB (CH2M Hill)
- AFCEE/AFCEC, McClellan and Castle AFB (Jacobs Engineering Group)
- AFCEE/AFCEC, Beale AFB (Law/Crandall, Inc.)
- AFCEE/AFCEC, Andrews AFB (URS)
- Navy CLEAN Atlantic Division (EA Engineering)
- Navy CLEAN IV Southwest DIV (AECOM)
- Navy RAC Southwest Division (OHM Remediation/IT Group/Shaw)

LDC has successfully performed over 500 data validation projects worth over 10 million dollars for prime contractors servicing Air Force (AFCEE/AFCEC), Army Corps, Navy, and industrial activities.

LDC has developed well-documented procedures which support all facets of the data validation process. This includes critical steps such as:

- Project tracking
- Peer review for all data validation activities
- Internal training programs
- Internal and external audits
- Strict documentation
- Electronic deliverables

LDC as the "Best Value" Contractor

LDC is a data validation subcontractor with an impeccable track record for timeliness, quality, technical expertise, and the ability to mitigate complex data quality issues. Our clients will confirm our current and past performance under DoD (including USACE), DoE, and commercial programs. We have experience and a proven track record commensurate with the requirements of this RFP as demonstrated by the following:

- **LDC is the software developer and expert in the use of the Automated Data Review (ADR) software**. LDC has been using ADR.NET and has the current version in full implementation which meets USACE and current DoD QSM requirements. LDC has performed over 1000 ADR projects in the past 10 years, worth over $2,000,000 in revenue. LDC will provide technical support to the Client as needed for e-QAPP generation or EDD troubleshooting.

- Data validation experience as a subcontractor for more than 100 Army Corps sites, over 140 AFCEE/AFCEC sites, several EPA sites, and under 6 Navy CLEAN and RAC contracts and 150 Navy sites. This experience includes 15 years of data validation work under USACE direction and thorough understanding of the USACE Baltimore, EPA Region 2 and 3 validation guidelines, and the DoD QSM.

- Successful completion of USACE data validation activities since 1992 under subcontracts to various Districts including New England, Baltimore, Philadelphia, Omaha, Albuquerque, Seattle, Sacramento, and Jacksonville.

- Recent project experience in the Eastern region including support to four separate contractors on the Passaic River for varied projects and programs with revenues of 200K, and Gowanus Canal with GEI, revenues of 33K.

- **On-time delivery record of greater than 99%** with the ability to expedite turnaround as needed due to our large experienced staff as noted above.

- Successful completion of five DoD and two DoE audits to approve LDC's internal data validation procedures, QA program and documentation systems. (prior to 2000)

- Thorough secondary QA review program and **the capacity (33 full time chemistry staff) to handle a project of this magnitude and importance.** This significantly reduces additional work the consultant might otherwise need to do upon receipt of LDC reports.

Data Validation Capacity

LDC is continually evaluating and monitoring its capacity to meet client needs. It is company policy to not accept a project unless the service can be completed on-time with our expected quality of performance. This policy has proved very successful in meeting past project deadlines. Our client references will confirm our performance of on-time delivery.

Due to the versatile capabilities of our staff, personnel can also support multiple areas which are high in backlog. Our training program documents personnel approvals for all data review activities. All of our staff actively participate in the LDC training program.

LDC has met its contractual turnaround time requirement on over 99% of the projects completed. LDC has successfully completed projects which required data review capacity of as many as 2000 samples in one month.

Technical / Management Approach

LDC has established data validation and data management procedures which enable the thorough, consistent, timely, and efficient review of analytical data. Ms. Stella Cuenco, principal chemist, is responsible for all data validation related activities and has final authority for the company. The designated Project Manager will coordinate the day to day data validation activities and interface with the Client project chemist or PM as necessary. For day to day data review activities, data validators report directly to the senior chemist in the section of the review. Senior chemists report to the technical project manager. Data validation will be performed following the Client project specific requirements as stated in the Scope of Work (SOW).

As the Client alerts LDC of in-coming SDGs and associated ADR EDDs, the LDC project manager will log the order into the up-coming project list identified as the "LDC Project Backlog" form. This is now considered a booked order and is reserved a place in the schedule. The project manager will allocate and schedule staff resources for the project. He will generate a project specific summary which will detail the expected receipt date of the order, the due date, special method or QC requirements, and the data quality objectives (DQOs) of the project.

Once the data packages arrive, the packages are logged in according to LDC SOP 6.0.0 "Standard Operating Procedure for Sample Data Log-in". Computer generated worksheets for each SDG along with the "LDC SDG Table" and "LDC Sample Validation" spreadsheet are distributed to all project staff.

The "LDC SDG Table" spreadsheet is specific to each order and provides the project manager with an overview of individual SDGs and their associated analyses. Progress of projects is indicated daily on the spreadsheet. The "LDC Sample Validation" spreadsheet identifies individual analysis requested for all samples and supports the data reviewer in verifying that appropriate samples have been reviewed in each data package. The previously discussed tools and processes have been used to successfully meet deadlines and estimate project completion dates. Meetings are held routinely to assess the status of each project.

Throughout the data review process, the project manager monitors project status as stated above. If any scheduling or technical complications arise such that the quality of the review will be impacted, data review staff notify the project manager immediately for resolution. The project manager will keep the Client chemist current on the progress of all validation activities on a

routine basis via e-mail and telephone. Once the data review worksheets have been completed and approved by a secondary review, the final technical reports are written. All final technical reports are reviewed by at least two senior staff. This may include the Technical Project Manager, QA Director, or Lead Chemist. Upon shipping the final report, the Client project chemist will be contacted by phone.

Data Review/Validation Process

The data review and validation level of effort required for the Scope of Work outlined for this project will encompass several activities. The steps can be categorized in the following manner:

1) Sample Log-in

All samples submitted for data validation are entered into the LDC Log-in system. The system generates various spreadsheets for sample tracking, listings of laboratory and client identifications, sampling dates, analysis requested, matrix, and project due date. These tracking documents are distributed to all data validation, QA and project management staff.

2) Pre-screening of Data Packages

The pre-screening is performed concurrently with the sample log-in process. This task verifies sample chain-of-custody, data package completeness, and concurrence with the authorized delivery order.

3) Data Validation

The execution of the data review task requires the highest level of effort. The review process will be handled in a stepwise fashion including manual and automated data review. The validator will use manual review to document each finding on a Validation Findings form. Along with the finding, the reviewer will document the date of the occurrence, the lab reference identification, the validation criteria, the associated samples, and the qualification of the data. A Validation Checklist form is marked noting if validation criteria was met or exceeded. A Validation Checklist is enclosed for review (Exhibit A). These checklists are used as an inventory sheet to assure all samples were reviewed for each criteria. The findings documented on the Validation Findings form will be transcribed into the final summary report. Examples of recalculation and findings worksheets used for Level 4 validation are available for review upon request.

All initial validation performed by LDC has a secondary peer review. All final reports will be reviewed by a Senior Chemist or Principal Chemist.

4) First Report Review

The first review of the data validation report verifies that all findings and data qualification has been accurately transferred from the data validation worksheets. All sample identifications, methods, formatting, and general text are reviewed.

5) Senior Report Review

The senior review of the data validation report verifies that all findings, data qualification, and professional judgments previously integrated into the reports reflect the overall quality of the data. Any additional comments required to enhance the usability of the report will be inserted at this time.

6) QA Report Review

A QA check of selected data validation reports within an individual delivery order will be reviewed by the QA department. A formal nonconformance report will be generated for any identified deficiencies. The deficiency will be addressed with the appropriate staff and corrected prior to submittal to senior management for final review and signature.

7) Senior Management Review

The program/technical manager will perform an overall review of the final reports. He will sign the report cover letter and submit the report to the sample custodian for shipment to the client.

8) Electronic Data Deliverables (EDD)

This process will be initiated at step 1 with the receipt of files from the client or loading EDDs to LDC's secured Internet portal. After automated verification of the EDD format, content, and fields, the EDD will be populated with the manual review for importing of the final data qualifiers. The final approval of qualifiers will occur after step 5.

LDC will self-perform the above tasks to maintain quality and control of the work product.

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Exhibit A

LDC #:____
SDG #:____
Laboratory:___

VALIDATION COMPLETENESS WORKSHEET

EPA Level IV

Date:_____
Page:_of_____
Reviewer:
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 8260B)
The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	/	
II.	GC/MS Instrument performance check		
III.	Initial calibration/ICV	/	
IV.	Continuing calibration		
V.	Laboratory Blanks		
VI.	Field blanks		
VII.	Surrogate spikes		
VIII.	Matrix spike/Matrix spike duplicates		
IX.	Laboratory control samples		
X.	Field duplicates		
XI.	Internal standards		
XII.	Compound quantitation RL/LOQ/LODs		
XIII.	Target compound identification		
XIV.	System performance		
XV.	Overall assessment of data		

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank
SB=Source blank
OTHER:

	Client ID	Lab ID	Matrix	Date
1				
2				
3				
4				
5				

Notes:

LDC Corporate Resources

LDC personnel have experience and formal training in the areas of data validation, electronic data deliverables and laboratory QA/QC. LDC personnel have performed data validation in all analytical disciplines. These include, but are not limited to, GC/MS volatiles, GC volatiles, GC/MS semivolatiles, GC pesticides, ICP metals, ICP/MS metals, GFAA metals, GC petroleum hydrocarbons, GC/MS dioxins, explosives, radiochemistry, and wet chemistry. This versatility allows our organization to adapt to workload changes and allows for an excellent secondary review system. Our organization is structured to allow direct communication between project managers, data validators, and clerical staff which occurs on a daily basis.

With LDC's 25+ years as a national leader in the data validation industry and extensive experience supporting projects with multiple EPA regions, DoD and DOE facilities, LDC is confident our data validation services will successfully meet all project requirements. The validation group is managed by Ms. Stella Cuenco, principal chemist, who has over 25 years of experience, the software products and services group is managed by Mr. Scott Denzer, who has over 35 years of experience, and the overall operations are directed by Mr. Michael Takaki, president.

The validation group is divided into chemists by discipline, organics (GC/MS, GC and HPLC) and inorganics (wet chemistry, IC, ICP, ICP/MS). All chemists report to senior group leads. A separate group performs data package log-in to the LDC tracking system. Another group performs the EDD population and verification. Christina Rink-Ashdown, Chemist and Project Manager, leads this group and has over 6 years of experience in EDD population, preparation, and uploading to various databases.

The majority of the data validation staff at LDC have been employed for over 10 years with some senior staff over 15 years as noted in the attached resumes. This level of stability and experience will ensure project stability and consistency.

In addressing LDC's financial status, LDC has an excellent Dun & Bradstreet report and has been profitable for the past 15 years. LDC has grown at approximately 10% in each of the past 5 years and continues to be a leader in our environmental sector of the data quality business. References are available from our vendors and clients to confirm our business success. Our annual revenue of approximately $6,000,000 per year in data validation work makes LDC one of the largest independent data validation firms in the nation. In 2001, Mr. Richard Amano was the San Diego SBA Small Businessman of the Year through our sponsor Earth Tech.

LDC will commit the resources and materials to successfully complete this project with the required time period and with a high level of quality.

Project Team Summary

LDC personnel have hands-on experience in the areas of data validation, laboratory QA/QC, CLP SOWs, and environmental laboratory analyses. As documented in the resumes of our staff, the project team has significant experience with USACE and DoD protocols, current technology, SW-846, and all methods stated in the SOW.

LDC is presenting the following staff to perform key roles for this contract. The key staff of the project team and their experience are as follows:

- **Stella Cuenco, Principal Chemist/Operations Manager**
  Project Role: Principal Chemist/Program Manager
  Data Validation Experience: 24 years
  Overall Laboratory and Data Validation Experience: 30 years
  B.S. Chemistry, University of the Philippines, 1991

  Ms. Cuenco has over 30 years of environmental laboratory and data validation experience under DoD and EPA guidelines. Her experience includes performance of data validation in gas chromatography/mass spectrometry for volatile and semivolatile organics and extensive Navy and EPA data review and data verification for all organic and inorganic analyses. Her laboratory experience includes hands-on CLP and SW-846 GC/MS methods.

- **Pei Geng, Senior Chemist/Project Manager**
  Project Role: Senior Organic Data Validator
  Data Validation Experience: 23 years
  Overall Laboratory and Data Validation Experience: 30 years
  M.S. Chemistry, Sam Houston University, 1989

  Ms. Geng will perform the role of organic data validator for this project. She will perform data validation for GC/MS and gas chromatography analyses and serve as a peer reviewer in the initial validation review process.

  Ms. Geng has over 30 years of environmental laboratory and data validation experience. Her experience includes performance of data validation in the gas chromatography area for volatile and semivolatile organics and extensive DoD data review and data verification for all organic analyses. Her laboratory experience includes hands-on CLP and SW-846 GC/MS methods.

- **Richard M. Amano, Principal Chemist**
  Project Role: Senior Technical Reviewer/Director
  Data Validation Experience: 29 years
  Overall Laboratory and Data Validation Experience: 41 years
  B.S. Biochemistry, UCLA, 1979

  Mr. Amano has over 40 years of environmental laboratory, QA/QC, and data validation experience. He has managed data validation projects using the DoD QSM data validation guidelines for the past twenty years. Prior to founding LDC in 1991, he directed two major laboratories, Analytical Technologies, Inc. and Brown and Caldwell, from 1983 to 1991. His data validation experience includes oversight and direction of major efforts for Superfund sites, DoE sites, Navy RI/FS projects, Army Corps of

Engineers investigations, and AFCEE/AFCEC projects. He also has overseen several laboratory audits for major analytical testing programs for the Navy, Texaco, and Hewlett-Packard. His laboratory experience includes hands-on CLP and SW-846 GC/MS analysis, direction of GC/MS (including TO-14 air analyses) and radiochemistry groups, dioxins method development, and complex GC data interpretation of Aroclors. He has performed expert witness support for litigation purposes.

- **Christina Rink-Ashdown, Inorganic Chemist/Project Manager**
  Project Role: Inorganic Data Validator/Project Manager
  Data Validation Experience: 11 years
  Overall Laboratory and Data Validation Experience: 13 years
  B.S. Biology, University of California, San Diego 2006

  Ms. Rink-Ashdown will perform the role of day to day Project Manager for this project. She will monitor schedules, compliance of validation to the Required Guidelines, perform routine surveillance activities such as generation of non-conformance reports, validator training and QA reports to management.

  Ms. Rink-Ashdown has over 13 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the trace metals, radiochemistry, and wet chemistry areas for major Federal and commercial projects. Her laboratory experience includes hands-on CLP and SW-846 ICP/CVAA analysis and overall technical review of data deliverables.

  Ms. Rink-Ashdown specializes in the data validation of radiochemistry, trace metals, wet chemistry, and methyl mercury and analyses under MARLAP and USEPA functional guidelines or equivalent protocol. Over the past two years, she has worked under various DoD, CERCLA and EPA data validation guidelines for the various CERCLA, Navy, Army Corps, AFCEE/AFCEC and commercial projects. She is also certified as a "Radiometric Data Validation Specialist" through course work and testing by the Radiochemistry Society.

- **Kevin Kha, Project Manager**
  Project Role: Project Management Assistance
  Data Validation Experience: 4 years
  Overall Laboratory and Data Validation Experience: 4 years
  B.A. Marine Sciences and Integrative Biology, UC Berkeley, 2014

  Mr. Kha has 4 years of data validation experience and specializes in the use of LDC Automated Data Review (ADR) software for validation, contract compliance screening, building eQAPPs libraries, and writing data validation reports (DVR) for projects utilizing ADR. He also builds eQAPPs and performs validation in the FUDSChem database, as well as data submission tasks in the ERPIMS database. He is also proficient in data validation for general chemistry and ICP/ICP-MS metals for Levels II through IV.

- **Tony Rommelfanger, Data Control Manager**
  Project Role: Data Custodian

  Mr. Rommelfanger will perform the role of data custodian for this project. He will perform the log-in of all data packages into the LDC tracking system. This system will generate spreadsheets for identifying all samples, their collection date, analysis performed,

matrix, and report due date. Upon the completion of each delivery order, he will archive and catalog all reports and data in a secured storage area.

Mr. Rommelfanger has over 28 years of experience in laboratory and data management experience. He has experience in organizing, logging in, and tracking data packages for technical staff.

Resumes of Key Staff

- Stella Cuenco, Senior Chemist
- Pei Geng, Senior Chemist
- Richard Amano, Principal Chemist
- Christina Rink-Ashdown, Inorganic Chemist
- Kevin Kha, ADR/EDD Specialist

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RESUME
STELLA S. CUENCO

EDUCATION

B.S. Chemistry, 1991
University of the Philippines (UP)

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Senior Chemist
1996 to present

Ceimic Corporation
GC/MS Chemist
1996

Analytical Technologies, Inc.
GC/MS VOA Group Leader
1992 to 1996

Analytical Technologies, Inc.
GC/MS Chemist
1991 to 1992

Natural Products Research, UP
Research Assistant
1990 to 1991

REPRESENTATIVE EXPERIENCE

Ms. Cuenco has over 30 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the GC and GC/MS areas for major Federal projects. She has performed large validation projects under Boeing, Navy Southwest, Northwest and Pacific Division, EPA Region IX ESAT, USACE and AFCEE/AFCEC programs. Her laboratory experience includes hands-on CLP and EPA analysis of GC and GC/MS volatile organic compounds.

Specifically, Ms. Cuenco has over 24 years organic data validation experience using USEPA (including Region III) functional guidelines and other applicable documents.

- As senior chemist with LDC, Ms. Cuenco specializes in the data validation and contract compliance screening of gas chromatography-mass spectrometry analyses as well as gas chromatography analyses. She has a thorough knowledge and understanding of gas chromatography and gas chromatography-mass spectrometry (GCMS) and high resolution GCMS methods referenced in EPA CLP, SW-846, EPA 500, 600 and 1600 series documents. She has performed large data validation under Boeing, Navy Southwest and Pacific Divisions and EPA Region IX ESAT, USACE and AFCEE/AFCEC projects.

Ms. Cuenco has over 6 years experience in an environmental laboratory performing the analysis of organic parameters.

- As GC/MS chemist at Ceimic Corporation, a full service environmental analytical chemistry facility, Ms. Cuenco performed GC and GC/MS volatile analyses. She was responsible for the final reporting of analytical data for this section.

- As GC/MS VOA Group Leader at Analytical Technologies Inc., a full service environmental analytical chemistry facility, Ms. Cuenco was responsible for all GC/MS functions which included overseeing daily operations, training staff, final reporting of analytical data, and compliance with method requirements.

- As research assistant at Natural Products Research, UP, Ms. Cuenco researched chemical literature for plants with known medicinal properties as well as performed microbiological and pharmacological tests on plant extracts.

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RESUME
PEI GENG

EDUCATION

M.S. Organic Chemistry, 1989
Sam Houston State University

B.S. Environmental Chemistry, 1983
Nankai University

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Senior Chemist
1997 to present

Ceimic Corporation
GC/MS and GC Chemist
1996 to 1997

PACE Analytical Service Inc.
GC/MS and GC Chemist
1990 to 1996

REPRESENTATIVE EXPERIENCE

Ms. Geng has over 30 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the GC and GC/MS areas for major Federal projects. She has performed large validation projects under Boeing, Navy Southwest, Northwest and Pacific Division, EPA Region IX ESAT, USACE and AFCEE/AFCEC programs. Her laboratory experience includes hands-on CLP and EPA analysis of GC and GC/MS volatile organic compounds.

Specifically, Ms. Geng has over 23 years organic data validation experience using USEPA CLP (including Region III) functional guidelines and other applicable documents.

- As chemist with LDC, Ms. Geng specializes in the data validation and contract compliance screening of gas chromatography-mass spectrometry analyses as well as gas chromatography analyses. She has a thorough knowledge and understanding of gas chromatography and gas chromatography-mass spectrometry (GCMS) and high resolution GCMS methods referenced in EPA CLP, SW-846, EPA 500, 600 and 1600 series documents. She has performed large data validation under Boeing, Navy Southwest and Pacific Divisions and EPA Region IX ESAT, USACE and AFCEE/AFCEC projects.

Ms. Geng has over 7 years of experience in an environmental laboratory performing the analysis of organic parameters.

- As both a GC and GC/MS chemist at Ceimic Corporation, a full service environmental analytical chemistry facility, Ms. Geng performed GC and GC/MS volatile and semivolatile analyses.

- As both a GC and GC/MS chemist at PACE Analytical Service Inc., a full service environmental analytical chemistry facility, Ms. Geng performed GC and GC/MS volatile and semivolatile analyses as well as overseeing the final reporting of analytical data, and compliance with method requirements.

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RESUME
RICHARD M. AMANO

EDUCATION

B.S. Biochemistry
University of California, Los Angeles, 1979

A.A. Chemistry
El Camino College, 1977

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Program Manager/Principal Scientist
2011-present
President/Principal Chemist,
1991 to 2011

Analytical Technologies, Inc
Laboratory Director
1986 to 1991

Brown & Caldwell
Laboratory Supervisor
1983 to 1986

West Coast Technical Service
Senior Chemist
1980 to 1983

University of California, Los Angeles
Laboratory Technician
1979 to 1980

REPRESENTATIVE EXPERIENCE

Mr. Amano has over 41 years of combined environmental laboratory, QA/QC, laboratory auditing, data management, environmental software development, and data validation experience. Prior to founding LDC in 1991, he directed to two major laboratories, Analytical Technologies, Inc. (San Diego) and Brown and Caldwell. His experience includes oversight and direction of major QA/QC and data validation efforts for confidential petroleum spill projects, Boeing sites, Superfund sites, DoE sites, Navy RI/FS projects, Army Corps of Engineers investigations, and AFCEE/AFCEC projects. He has also overseen several laboratory audits for major analytical testing programs and large scale environmental software development for the US Army Corps of Engineers (USACE).

Specifically, Mr. Amano has over 29 years of experience with validation of organic, inorganic, and radiochemical analyses using USEPA, Navy, USACE, DoD, AFCEE/AFCEC, and other applicable guidance documents.

- As program manager/principal scientist with LDC, Mr. Amano provides management and technical support to the data validation, data quality, and software group. He oversees and directs all environmental software projects developed for the USACE. Additionally, he acts as the primary LDC/USACE contract manager for software development projects. He is the primary author of the nationally distributed Automated Data Review (ADR) software used by the USACE, Navy, DTSC, and commercial clients.

- As President/principal chemist with LDC, Mr. Amano provided management and technical support to the data validation, data quality, and software group. He provided technical support in the organic, inorganic, and radiochemical areas. Under several major QA/QC and data validation programs, he provided, as needed, a final review of data validation and assessment reports. Mr. Amano specializes in the evaluation, validation, and interpretation of environmental testing data. Additional responsibilities include laboratory QA/QC and NELAC audits, implementation and support of QA/QC programs and data management support for engineering firms, environmental lab training, consultation on LIMS data base designs for environmental laboratories, and expert witness litigation support. Mr. Amano has managed and directed several major data validation and QA/QC projects for Army Corps, Navy, Air Force, and commercial contracts. Industrial projects include major petroleum oil spill related data validation and assessment of hydrocarbon analyses. The DoD projects include Southwest Division CLEAN 1 (Jacobs Engineering/IT Corporation/CH2M Hill), Southwest Division CLEAN 2 (Bechtel National), Pacific Northwest Division CLEAN (URS Greiner), Southern Division CLEAN (ABB Environmental), Atlantic Division CLEAN (EA Engineering), Southwest Division RAC (OHM Remediation), Pacific Division CLEAN (Earth Tech), AFCEE/AFCEC Mather AFB (Montgomery Watson), AFCEE/AFCEC Pease AFB (Bechtel Environmental), AFCEE/AFCEC England AFB (Law Environmental), Army Corps Travis AFB (CH2M Hill), Army Corps Hawthorne Army Depot (Tetra Tech), Nevada Test Site (IT Corp), and Army Corps Fort Ord (Harding Lawson). He provided oversight and direction for major USACE environmental software development including Automated Data Review (ADR), FUDSFORUM, MRSPP, and FUDSCHEM. He has a thorough knowledge and understanding of EPA CLP, SW-846, EPA 500, EPA 900, and EPA 600 series methods. He additionally has supported attorneys as an expert witness and has taught data integrity and lab ethics courses for several organizations.

Mr. Amano has over 12 years environmental laboratory experience in commercial laboratories supervising or performing the analyses of organic, inorganic, and radiochemical parameters.

- As laboratory director and technical director of Analytical Technologies, Inc, a full service environmental analytical chemistry facility, Mr. Amano was responsible for all facets of operations. These responsibilities include direct technical input for GC, GC/MS, and inorganic operations, personnel selection, assisting in method development, and selection of non-routine analysis. In addition, Mr. Amano was responsible for supervision of the 80 scientists employed at ATI's San Diego laboratory with all group supervisors, quality assurance and safety coordinators reporting directly to him. Mr. Amano has managed numerous analytical testing programs including the North Island Navy Confirmation Study, Miramar Air Force Base Confirmation Study, and investigations at several of the EPA Superfund sites. His environmental expertise focuses on the chemical testing related to hazardous waste investigations, site remediation, and groundwater monitoring programs.

- While at Brown & Caldwell, Mr. Amano's responsibilities encompassed supervision of daily operations of the laboratory, personnel staffing, technical advisor for operation of the gas chromatograph/mass spectrometer (GC/MS) section, maintenance of QA/QC programs, and coordination between engineers, clients, and laboratory analysts. Additionally, he supervised the daily operation of all radiochemistry activities which included alpha, beta, and radium analyses.

- At West Coast Technical Service, Mr. Amano was responsible for daily operation and quality control of the GC/MS group. Mr. Amano was highly involved with the USEPA hazardous waste contracts. Some special projects included dioxin selected ion monitoring analysis, EPA method 624 and 625 validation studies, and low level drinking water evaluations.

TECHNICAL PRESENTATIONS

"Understanding the Workings of an Environmental Laboratory"
Southern California Department of Health Services, 1984
Hargis & Associates, Inc, La Jolla, CA, 1987
Hargis & Associates, Inc, Tucson, AZ, 1987
Westec Services, San Diego, CA, 1987
Applied Hydrogeologic, Inc, San Diego, CA 1989

"Data Validation, QA/QC, and Environmental Analysis"
Van, Waters, and Rogers, Seattle, WA, 1990
ERC Environmental, Honolulu, HI, 1991
Harding Lawson Associates, Honolulu, HI, 1991
Pacific Division Naval Engineering Group, Honolulu, HI, 1991
OHM, Irvine, CA, 1996
Southwest Division Naval Engineering Group, San Diego, CA, 1996
Navy Public Works Center, San Diego, CA 1996

"GC versus GC/MS"
J.H. Kleinfelder & Associates, Artesia, CA 1986
Hargis & Associates, Inc, La Jolla, CA 1987

"Analytical Methods and QA/QC Procedures for Environmental Analysis"
County of San Diego Department of Health Services, San Diego, CA 1989
Regional Water Quality Control Board, San Diego, CA 1990
ERC Environmental, San Diego, CA 1990
Mittlehauser Corporation, Laguna Hills, CA 1991

"Hydrocarbon Testing Related to Underground Storage Tanks (UST)"
San Diego County DOHS, San Diego, CA, 1986
J.H. Kleinfelder & Associates, Artesia, CA 1986
Woodward Clyde Consultants, San Diego, CA 1987

Engineering Enterprises, Long Beach, CA 1987

"Quality Control/Quality Assurance in Laboratories"
Assoc of Hazardous Materials Professionals, Anaheim, CA 1986
R.L. Stollar & Associates, Santa Ana, CA 1989

"The Influence of Sample Matrix on Environmental Analysis"
Assoc of Hazardous Materials Professionals, San Diego, CA 1990

"Comparison of Air Sampling Media"
Assoc of Hazardous Materials Professionals, Anaheim, CA 1991

"Building a Second Generation LIMS for Commercial Laboratory Operations"
Pittsburgh Conference, New York, NY, 1990 (Invited Speaker)

"Employment Outlook in Environmental Laboratories"
Southern California American Chemical Society, 1985

"Opportunities in the Environmental Lab in the 1990's"
American Chemical Society, 1990

"Data Validation of Radiochemical Analyses"
Hargis + Associates, La Jolla, CA 1991

"Detection Limits - MDL, PQL, RDL, LOD ?"
Analytical Technologies, Inc., 1991

"Poor QA/QC or Laboratory Fraud: Have labs crossed the fine line?"
Environmental Professionals Organization, Newport Beach, CA 1996

"Electronic Data Deliverables and Automated Data Review/Validation"
Army Corps of Engineers, Sacramento District, Sacramento, CA 1996

"Navy Environmental Data Transfer Standards"
Kleinfelder, San Diego, CA 1997

"Laboratory QA/QC Update for DoD Programs"
ACTLabs, Long Beach, CA 1997

LECTURING AND TEACHING

"Instrumental Analysis of Hazardous Materials"
University of California, San Diego 1988 - 1995

"Field Monitoring & Laboratory Analysis of Hazardous Materials"

University of California, San Diego 1995 - 1998

California State Fullerton, Guest Lecturer, 1985 & 1990

San Diego State University, Hydrology Department, Guest Lecturer, 1988

"EPA Level 4 Data Validation" Workshop
Applied Geotechnology, Inc., Bellevue, WA, 1993

"Environmental Analyses in the 90's"

National University, Guest Lecturer, 1993

"Data Quality Objectives for Federal Environmental Programs"
University of California, San Diego 1993

"Data Integrity and Data Management for Federal Environmental Programs"
University of California, San Diego 1994

"Laboratory QA/QC and Electronic Data Requirements for DoD Programs"
University of California, San Diego 1995

"Application and Utilization of Department of Defense (DoD) Guidance Documents"
University of California, San Diego 1996

"Laboratory Quality Assurance for Department of Defense Programs"
University of California, San Diego 1997

PUBLICATIONS

"Managing an Environmental Chemistry Laboratory for Profit",
John H. Taylor, Jr and Richard M. Amano,
Journal of Chromatographic Science, 1987

MEMBERSHIPS AND AFFILIATIONS

American Chemical Society
Association of Hazardous Materials Professionals, (Steering Committee 1988-1994)
Association of California Testing Laboratories, (Board Member 1989-1991)
County of San Diego, Site Assessment and Mitigation Technical Forum (Steering Committee 1990-2000)
American Society Quality Control (1992-2005)

FOUNDATIONS

Golf for Autistic Children in America (GACA), Founder/President (2011)

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RESUME
CHRISTINA RINK-ASHDOWN

EDUCATION

BS Biology, 2006
University of California, San Diego

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Inorganic Chemist
2009 to present

Enviromatrix Analytical, Inc.
Metals Chemist
2007 to 2009

REPRESENTATIVE EXPERIENCE

Ms. Rink-Ashdown has over 13 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the trace metals, radiochemistry, and wet chemistry areas for major Federal and commercial projects. Her laboratory experience includes hands-on CLP and SW-846 ICP/CVAA analysis and overall technical review of data deliverables. Specifically, Ms. Rink-Ashdown has over 6 years inorganic and radiochemistry data validation experience using USEPA (including Region III) functional guidelines and other applicable documents.

As chemist with LDC, Ms. Rink-Ashdown specializes in the data validation of trace metals, wet chemistry, methyl mercury and radiochemistry analyses using USEPA functional guidelines or equivalent protocol. She has worked under various CERCLA and EPA data validation guidelines for the various CERCLA, Navy, Army Corps, AFCEE/AFCEC and commercial projects. She is certified as a “Radiometric Data Validation Specialist” through course work and testing by the Radiochemistry Society. **Ms. Rink-Ashdown has validated over 2,000 samples for various isotopes in the last two years.**

Ms. Rink-Ashdown has over 2 years of environmental laboratory experience in a laboratory performing the analyses of inorganic parameters.

As lead inorganic chemist at Enviromatrix Analytical, Inc., Ms. Rink-Ashdown managed the inorganic chemistry section which performed techniques such as atomic absorption and inductively coupled argon plasma spectrometry. These analyses were performed from methods referenced in EPA CLP, SW-846, and Standard Methods documents.

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RESUME
KEVIN KHA

EDUCATION

B.A. Marine Sciences and Integrative Biology, 2014
University of California, Berkeley

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.
Project Manager (ADR/EDD Specialist and Inorganic Chemist)
2016 to present

REPRESENTATIVE EXPERIENCE

Mr. Kha has five years of experience ranging from validating electronic data deliverables (EDDs) through Automated Data Review (ADR) software, to manual data validation of trace metals, general chemistry, and radiochemistry, as well as submission of data and reports to various environmental chemistry databases.

As the ADR/EDD specialist with LDC, Mr. Kha has completed over 1,500 data validation reports utilizing ADR software. His experience also includes the creation of numerous eQAPPs for LDC's ADR and FUDSChem ADR. He has also submitted data and validation reports for various FUDS, AFCEE/AFCEC, and commercial projects to databases like FUDSChem and ERPIMS. Mr. Kha has 3 years of data validation experience of trace metals, general chemistry, and radiochemistry in accordance with USEPA functional guidelines and DOD QSM for Stages 2a through Stage 4 validation.

As a project manager with LDC, Mr. Kha assists the other project managers through project set-up, validation, report review, and writing project data quality assessment reports.

Relevant Project Experience

LDC has performed data validation and Quality Assurance services for contaminated sites overseen by AFCEE/AFCEC, Navy Southwest Division, DoE, DoD, EPA Superfund projects overseen by EPA Regions II, III, IV, IX, X, USACE projects reviewed by the Alaska, Baltimore, Louisville, Albuquerque, Seattle, Philadelphia, and Sacramento Districts, and Navy projects reviewed by NFESC.

LDC is the software developer and expert in the use of the Automated Data Review (ADR) software. LDC has been using the ADR.NET version and has the current Version in full implementation. LDC has performed over 1000 ADR projects in the past 10 years' worth over $2,000,000 in revenue. ADR clients include, but are not limited to: Tetra Tech EC, Sealaska, AMEC, EPA, California DTSC, MWH, Trevet, Brown & Caldwell, AECOM, Shaw, ITSI, CDM, Weston Solutions and the San Gabriel Watermaster.

LDC has validated over 1,000,000 samples for analyses such as volatile organics (CLP, EPA Method 8240/8260), semivolatile organics (CLP, EPA Method 8270), organochlorine pesticides/PCBs (CLP, EPA Method 8081/8082), chlorinated herbicides (EPA Method 8151), purgeable halocarbons and aromatics (EPA Method 8021), trace metals (CLP, EPA Method 6010/6020/7000), PAHs by EPA 8310 and 8270,TOC analyses, hexavalent chromium, total petroleum hydrocarbons (EPA Method 8015/CDOHS LUFT), radiochemical constituents including gross alpha/beta, alpha spec, gamma spec, tritium, and uranium, and general minerals.

LDC has met their contractual turnaround time and quality requirements on over 99% of the projects completed.

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Project References/Experience

Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value ($)	Start/Stop
EA Engineering 225 Schilling Circle Hunt Valley, MD 21031 Project Manager ATTN: Ms. Brenda 615 Piikoi Street, Honolulu, HI 96814 Office: (808) 589-1455, x102 Fax: (808) 589-1575 Mobile: (808) 256-8268 E-mail: bnuding@eaest.com Nudingbnuding@eaest.com	Fairchild AFB LDC performed Stage2B and 4 data validation for PFAs and Wet Chemistry analyses and EDD population.	Stage 2B and 4 data validation reports. Work conducted under Working Copy Quality Assurance Project Plan for Environmental Remediation Services FAFB and PFAS Fairchild Air Force Base, Spokane County, Washington (July 2019) and the USEPA Data Review and Validation Guidelines for Perfluoroalkyl Substances (PFAS) Analyzed Using EPA Method 537 (November 2018).	>400 Water	$6,727	08/2019-present
Cape Inc. 500 Pinnacle Court, Suite 100 Atlanta, GA 30071 ATTN: Mr. Wayne Vermeychuk wvermeychuk@cape-inc.com Office: 727.940.4713 Mobile: 678.492.9384	Mather AFB LDC performed Level II and IV data validation for a full suite of analyses including GCMS, GC, Metals, and Wet Chemistry analyses and ERPIMS EDD Upload.	Level II and IV data validation reports. Work conducted under Draft Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for Environmental Services for Western Region Base Realignment and Closure (BRAC) Bases, Mather Air Force Base (AFB), California (February 2017), the DoD QSM 5.2 (2018), and a modified outline of the USEPA NFG.	>1700 Water and Air	$55,142	02/2017-present

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Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value ($)	Start/Stop
Ayuda Companies 410 Acoma Street Denver, CO 80204 ATTN: Susan Royse Office: 303.999.2146 Fax: 303.999.2099 sroyse@ayudacompanies.com	Various Omaha AFB Sites LDC performed Level III and IV data validation for a PFAs analyses and ADR and SEDD population, and ERPIMS EDD Upload.	Level III and IV data validation reports. Work conducted under Addendum 3 to the Final Uniform Federal Policy – Quality Assurance Project Plan for Site Inspection of Aqueous Film-Forming Foam Areas, United State Air Force Academy (July 2018), the DoD QSM) 5.1 (2017), and the DoD General Validation Guidelines (February 2018).	>360 Water and Soil	$8434	02/2017-present
Washington State Department of Transportation Environmental Services Office P.O. Box 47332 Olympia, WA 98504 ATTN: Mr. Brad Archbold ArchboB@wsdot.wa.gov 360-570-6636	WSDOT NPDES Stormwater Monitoring LDC performed Stage2A, 2B and 4 data validation for a full suite of analyses including GCMS, GC, Metals, and Wet Chemistry analyses.	Stage 2A, 2B, and 4 data validation reports. Work conducted under Washington State Department of Transportation Stormwater Monitoring	>3,800 Soil and Water	$48,332	04/2013-07/2016
Leighton Consulting, Inc. 17781 Cowan Irvine, CA 92614 ATTN: Mr. Mark Withrow mwithrow@leightongroup.com cell: 949-394-2194 office: 949-681-4211	San Onofre Nuclear Generating Station (SONGS) Mesa Facility LDC performed EPA Level III and IV equivalent data validation for a full suite of analyses. Analyses included GCMS, GC, Metals, and Wet Chemistry analyses.	EPA Level III and IV data validation reports. Work conducted under USEPA Contract Laboratory Program National Functional Guidelines (CLPNFG).	>3,600 Soil, Water, and Air	$149,714	09/2015-present
Leighton Consulting, Inc. 17781 Cowan Irvine, CA 92614 ATTN: Ms. Julie Harriman jharriman@leightongroup.com Direct : (949) 681-4264 Cell: (949) 572-8129	Aliso Canyon LDC performed EPA Level II equivalent data validation. Analyses included VOA, SVOA, Total Hydrocarbons, Isopropyl Alcohol, Total Dust, and Sulfur Compounds.	EPA Level II data validation reports and PARCC summary report. Work conducted under USEPA Contract Laboratory Program National Functional Guidelines (CLPNFG).	>1,200 Air, Wipe, and Disk	$15,749	07/2016-08/2016

Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value ($)	Start/Stop
Tetra Tech, EM Inc. 1999 Harrison Street, Suite 500 Oakland, CA 94612 ATTN: Ms. Sara Woolley Sara.Woolley@tetratech.com Direct: 510.302.6311 Main: 510.302.6300	Subcontract 161408 For Various project sites including: EAGLE NEST INVESTIGATION FORT IRWIN GOLD BEACH MILL HPNS MARE ISLAND MOTCO LITIGATION NAF EL CENTRO NWS CONCORD LDC performed Cursory and Full data validation for a full suite of analyses using specified EPA Guidelines, DoD QSM Version 4.2, and Tetra Tech EMI, Inc. validation documents.	TTEMI Format data validation reports and EDD using Tetra Tech's validate program.	>3000 Soil and Water	$39,785	10/2011 – 10/2013
GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5342 direct (860) 368-5300 main Jaimie Wargo JWargo@geiconsultants.com	Various NYSDEC sites LDC performed Category B equivalent data validation Analyses included: VOC, SVOC, Pesticide, PCB, Herbicide, Steroids, Metals, Wet Chemistry	Category B data validation and NYSDEC DUSR reports	>1,700 Soil and Water	$72,000	2010-present
TetraTech EC 17885 Von Karman Ave, Suite 500 Irvine, CA 92614 Attn: Lisa Bienkowski (949) 809-5028 Lisa.Bienkowski@tetratech.com	Tetra Tech Hunter's Point CA LDC performed EPA Level III and IV equivalent data validation for a full suite of analyses on more than 50,000 soil and water samples. Analyses included tritium, isotopic thorium, uranium and plutonium, and gross alpha/beta. Expedited turnaround times were included (5 day TAT)	EPA Level III and IV data validation reports. Work conducted under US Navy RAC program, Southwest Div.	>50,000 Soil and Water	$645,733	02/2001-present
AECOM (Earth Tech) 700 Bishop Street Honolulu, HI 96813 Contact: Scott Lewis (808) 523-8874 Scott.Lewis@aecom.com	Data validation per EPA level "3/C" and "4/D" guidelines for volatile organic, semivolatile organic, pesticides/PCBs, herbicides, phenols, phosphorus pesticides, dioxin, radiochemical, and trace metal analyses in soil, water, and tissue matrices. (Navy PACDIV CLEAN, Honolulu, HI)	LDC worksheets and validation reports	>10,000 samples Water/Soil/Air	$750,000	4/98-present

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760/827-1100 Fax: 760/827-1099

Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value ($)	Start/Stop
CBI (formerly Shaw E&I) 3347 Michelson Drive, Ste 200 Irvine, CA 92612 Contact: Mr. Dwayne Ishida Phone: (949) 660-7561 Dwayne.Ishida@CBIFederalServices.com	Data validation per EPA level "3" and "4" and AFCEE/AFCEC guidelines for volatile organic, semivolatile organic, pesticides/PCBs, herbicides, phenols, phosphorus pesticides, dioxin, radiochemical, and trace metal analyses in soil, water, and tissue matrices. (Navy Southwest Division RAC, San Diego, CA and various AFCEE/AFCEC projects)	LDC worksheets and validation reports	>5000 samples Water/Soil/Air	$350,000	6/06-present
Santa Clara Pueblo Office of Environmental Affairs 578 Kee Street Espanola, New Mexico, 87532 Ms. Ernestine Naranjo 505-692-6270 phone 505-747-2728 fax enaranjo@santaclarapueblo.org	Data validation per EPA level "III" SCP-OEA-DEPO, Data Validation using ADR For full suite of Organic, Inorganic, and Radiochemical analyses. Radiochemical analyses including Gross alpha & beta, Gamma Spectroscopy, Iodine, Radium-226/228, Strontium-90, Isotopic Pu, Th, and U, Tritium, and Americium by various EPA and GA methods.	Level III validation using ADR	>2000 Soil, Water, and Air	$78621	12/2015 - present
Anchor Environmental, LLC 720 Olive Way, Suite 1900 Seattle, WA 98101 Ms. Joy Dunay 206.287.9130, jdunay@anchorqea.com	Data validation per Level “C” Newtown Creek Phase 2: Third Party Data Validation of laboratory results, EDD population, and Data Quality Assessment Reports (DQAR) for various methods Subcontractor	LDC worksheets and validation reports	>63,000 Soil and Water	$743,793.88	6/14-1/16
P.W.Grosser Consulting2015 630 Johnson Ave, Suite 7 Bohemia, NY 11716 Attn: Mr. Derek Ersbak w. 631.589.6353 f. 631.589.8705 dereke@pwgrosser.com	Former Arkansas Chemical Co.Site and Former Ronkonkoma Wallpaper Site 203 Jay St. LDC performed Category B equivalent data validation Analyses included: VOC, SVOC, Pesticide, PCB, Metals, Wet Chemistry	Category B data validation and NYSDEC DUSR reports	>200 Soil and Water	$3,024.00	11/2014-present
Amec Foster Wheeler Environment and Infrastructure, Inc. 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Attn: Mr. Rolf Schottle rolf.schottle@amecfw.com Tel +1 (858) 300 4300, Fax +1 (858) 300 4301, Direct +1 (858) 300 4323	Regional Harbor Monitoring Program (RHMP), San Diego, California Third party validation of LDC performed EPA Level III and IV equivalent data validation for a full suite of analyses.	LDC worksheets and validation reports	>200 Water	$9,011.40	3/15–6/16

Note: All above projects were 100% self-performed by LDC

APPENDIX G

Request for Import/Reuse Fill Material Form

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e). Use of this form is not a substitute for reading the applicable Technical Guidance document.

SECTION 1 – SITE BACKGROUND

The allowable site use is: Choose an item

Have Ecological Resources been identified? Choose an item

Is this soil originating from the site? Choose an item

How many cubic yards of soil will be imported/reused? Choose an item

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone? Choose an item

Does it contain less than 10%, by weight, material that would pass a size 80 sieve? Choose an item

Is this virgin material from a permitted mine or quarry? Choose an item

Is this material recycled concrete or brick from a DEC registered processing facility? Choose an item

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

_____ _____

Signature Date

_____

Print Name

_____

Firm

Revised August 2014

PLATES

1. Soil Sample Exceedances
2. Groundwater Sample Exceedances
3. Soil Vapor Sample Detections

SB-21-05	11/12/2021	11/12/2021	11/12/2021
Depth (ft bls):	4 - 6	6 - 8	8 - 10
METALS			
Copper	**106**	NE	NE
Lead	**631**	NE	NE
Mercury	**0.42**	**1.1**	ND
Zinc	**524**	**360**	NE

RX-26	01/12/2021	01/12/2021
Depth (ft bls):	3 - 5	5 - 7
METALS		
Arsenic	**15.9**	NE
Copper	**77.2 J**	NE
Lead	**134 J**	**140 J**
Mercury	**6.4**	**1.1**
Zinc	**163**	**266**

RX-1	09/26/2018	09/26/2018	09/26/2018	09/26/2018
Depth (ft bls):	0.5 - 2.5	5 - 7	8 - 10	13.5 - 15.5
VOCs				
1,2,4-Trimethylbenzene	NE	NE	**82 J**	NE
Benzene	**0.45**	ND	ND	ND
Ethylbenzene	**6.4**	NE	**1.1**	NE
N-Butylbenzene	NE	NE	**14**	NE
N-Propylbenzene	**4.4**	NE	**19**	NE
Xylenes, Total	**2.7**	NE	NE	ND
METALS				
Arsenic	**15**	NA	NE	NA
Copper	**55.2**	NA	NE	NA
Lead	**127**	NA	NE	NA
Mercury	**1.7**	NA	NE	NA
Zinc	**305**	NA	NE	NA

SB-21-01	11/10/2021	11/10/2021	11/11/2021	11/11/2021	11/11/2021	11/11/2021
Depth (ft bls):	2 - 4	4 - 6	6 - 8	10 - 12	13 - 15	15 - 17
VOCs						
N-Butylbenzene	ND	NE	NE	**29 J**	NE	NE
N-Propylbenzene	NE	NE	**5.2**	**54 J**	NE	NE
METALS						
Arsenic	**17.9**	NE	NE	NE	NE	NE
Lead	**89.5**	NE	NE	NE	NE	NE
Mercury	**0.31**	NE	NE	ND	NE	NE
Zinc	**178 J**	**274 J**	NE	NE	NE	NE

G1	11/10/2021	11/11/2021	11/11/2021
Depth (ft bls):	0 - 3	3 - 9	9 - 15
VOCs			
Ethylbenzene	ND	NE	**1.7**
N-Butylbenzene	ND	NE	**30**
N-Propylbenzene	ND	**9.8**	**75**
METALS			
Lead	**91.2**	NE	NE
Mercury	**0.31**	NE	ND
Zinc	**125**	**236**	NE

F1	11/09/2021	11/12/2021	11/12/2021
Depth (ft bls):	0 - 4.5	4.5 - 10.5	10.5 - 16.5
METALS			
Copper	**117**	NE	NE
Lead	**261**	**65.8**	NE
Zinc	**306**	**541**	NE

RX-2	09/26/2018	09/26/2018
Depth (ft bls):	0.5 - 2.5	10 - 12
VOCs		
Ethylbenzene	NE	**1.1**
N-Butylbenzene	NE	**16**
N-Propylbenzene	NE	**43**
METALS		
Arsenic	**46.2**	NE
Copper	**78.2**	NE
Lead	**307**	NE
Mercury	**0.26**	ND
Zinc	**200**	NE

MR-9	07/26/2018	07/26/2018
Depth (ft bls):	1 - 1.5	8 - 9
METALS		
Copper	**58.6**	NE
Lead	**134**	NE
Mercury	**0.2**	NE
Zinc	**144**	NE

RX-3	09/27/2018	09/27/2018	09/27/2018
Depth (ft bls):	0.5 - 2.5	0.5 - 2.5 DUP	8 - 10
METALS			
Copper	**192**	**194**	NE
Lead	**175**	**207**	NE
Mercury	**0.55**	**0.76**	NE
Zinc	**693**	**718**	NE

SB-21-07	11/09/2021	11/09/2021	11/12/2021	11/12/2021
Depth (ft bls):	0 - 2	2 - 4	4 - 6	6 - 8
METALS				
Cadmium	**4.8**	NE	NE	NE
Copper	**164**	NE	NE	NE
Lead	**299 J**	NE	NE	NE
Mercury	**0.8**	NE	NE	NE
Zinc	**480**	NE	NE	NE

RX-27	01/12/2021	01/12/2021	01/12/2021
Depth (ft bls):	3 - 5	7 - 9	12 - 14
METALS			
Barium	**532 J**	NE	NE
Cadmium	**3.3**	NE	ND
Copper	**68.9 J**	NE	NE
Lead	**204 J**	NE	NE
Mercury	**0.44**	NE	NE
Zinc	**575**	NE	NE
PCB			
Polychlorinated Biphenyl (PCBs)	**0.39**	ND	ND

F2	11/09/2021	11/12/2021	11/12/2021
Depth (ft bls):	0 - 4	4 - 10	10 - 16
METALS			
Lead	**104**	NE	NE
Mercury	**0.24**	NE	NE
Zinc	**157**	NE	NE

MR-11	07/23/2018	07/23/2018
Depth (ft bls):	0.25 - 0.75	5 - 6.5
METALS		
Lead	**70.4**	**95.3**
Zinc	**178**	**351**

F3	11/09/2021	11/12/2021	11/12/2021
Depth (ft bls):	0 - 3.25	3.25 - 9.5	9.5 - 15.5
METALS			
Cadmium	**7.9**	NE	ND
Copper	**91**	NE	NE
Lead	**290**	NE	NE
Mercury	**0.27**	NE	NE
Nickel	**51.3**	NE	NE
Zinc	**399**	NE	NE
PESTICIDES			
4,4'-DDT	**0.012**	ND	ND

SB-21-03	11/10/2021	11/11/2021	11/11/2021	11/11/2021
Depth (ft bls):	0 - 2	3 - 5	5 - 7	7 - 9
METALS				
Copper	**100**	NE	NE	NE
Lead	**113**	NE	**138**	NE
Mercury	**0.3 J**	NE	NE	NE
Zinc	**124 J**	**669**	**663**	NE
PCB				
Polychlorinated Biphenyl (PCBs)	**0.16**	ND	NE	ND

SB-21-04	11/09/2021	11/09/2021	11/12/2021	11/12/2021
Depth (ft bls):	0 - 2	0 - 2 DUP	4 - 6	8 - 10
METALS				
Cadmium	**8.1**	**8**	NE	ND
Copper	**71.4 J**	**66.6 J**	**59.9**	NE
Lead	**115 J**	**142 J**	**115**	NE
Mercury	**2.6**	**0.25**	**0.24**	NE
Nickel	**66 J**	**44.4 J**	NE	NE
Zinc	**535**	**393**	**207**	NE
PESTICIDES				
4,4'-DDE	**0.0043 J**	NE	**0.0041 J**	ND
4,4'-DDT	ND	ND	**0.0065 JP**	ND

G2	11/10/2021	11/12/2021	11/12/2021
Depth (ft bls):	0 - 3	3 - 9	9 - 15
METALS			
Cadmium	**3.3**	NE	ND
Copper	**90.3**	NE	NE
Lead	**234**	NE	NE
Mercury	**0.51**	NE	NE
Zinc	**453**	NE	NE
PESTICIDES			
4,4'-DDE	**0.004 J**	ND	ND
4,4'-DDT	**0.0046 J**	ND	ND

SB-21-06	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/12/2021
Depth (ft bls):	0 - 2	2 - 4	2 - 4 DUP	4 - 6	6 - 8
VOCs					
Acetone	ND	ND	ND	**0.08**	NE
METALS					
Copper	NE	NE	**54.9**	NE	NE
Lead	**102**	**146**	**140**	**89.1**	NE
Mercury	NE	**0.24**	**0.21**	NE	NE
Zinc	**132 J**	**157 J**	**175 J**	**198 J**	NE
PESTICIDES					
4,4'-DDT	**0.024 J**	ND	ND	ND	ND

SB-21-09	11/09/2021	11/12/2021	11/12/2021	11/12/2021
Depth (ft bls):	0 - 2	4 - 6	6 - 8	8 - 10
METALS				
Barium	**363**	NE	NE	NE
Cadmium	**53**	**33.6**	NE	NE
Copper	**325**	**172**	NE	NE
Lead	**623**	**133**	NE	NE
Mercury	**1.3**	**1.4**	NE	NE
Nickel	**48.2**	NE	NE	NE
Zinc	**2560**	**887**	NE	**164**
PCB				
Polychlorinated Biphenyl (PCBs)	**0.11**	NE	ND	ND
PESTICIDES				
4,4'-DDE	**0.03**	**0.0099**	ND	ND
4,4'-DDT	**0.068**	**0.028**	ND	ND

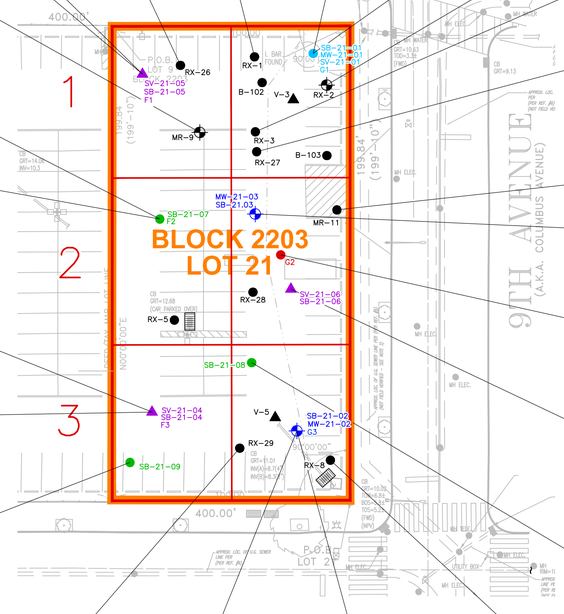
SB-21-08	11/10/2021	11/12/2021	11/12/2021	11/12/2021
Depth (ft bls):	0 - 2	3 - 5	5 - 7	7 - 9
METALS				
Cadmium	**2.7**	NE	NE	ND
Copper	**98.5**	NE	NE	NE
Lead	**212**	**226**	**72.2**	NE
Mercury	**0.39**	NE	NE	NE
Zinc	**303**	**569**	**111**	NE

RX-29	01/12/2021	01/12/2021	01/12/2021
Depth (ft bls):	0 - 2	5 - 7	5 - 7 DUP
SVOCs			
Benzo(A)Anthracene	ND	NE	**1.5**
Benzo(A)Pyrene	NE	NE	**1.5 J**
Benzo(B)Fluoranthene	NE	NE	**2 J**
Chrysene	NE	NE	**1.3**
Indeno(1,2,3-C,D)Pyrene	ND	NE	**0.83**
METALS			
Lead	NE	NE	**74**
Zinc	NE	**191**	**116**

SB-21-02	11/11/2021	11/11/2021	11/11/2021	11/11/2021
Depth (ft bls):	4 - 6	6 - 8	8 - 10	8 - 10 DUP
METALS				
Lead	**154**	NE	NE	NE
Zinc	**139**	NE	NE	NE

G3	11/09/2021	11/11/2021	11/11/2021
Depth (ft bls):	0 - 2.5	2.5 - 8.5	8.5 - 14.5
METALS			
Copper	**57.9**	**61.1**	NE
Lead	**458**	**147**	NE
Zinc	**198**	**323**	NE
PESTICIDES			
4,4'-DDE	**0.012**	ND	ND
4,4'-DDT	**0.02**	ND	ND

RX-8	09/27/2018	09/27/2018
Depth (ft bls):	0.5 - 2.5	8 - 10
METALS		
Copper	**473**	NE
Lead	**263**	NE
Mercury	**0.22**	NE
Zinc	**898**	**138**



LEGEND

- SB-21-02 / MW-21-02 / G3 — SOIL BORING AND MONITORING WELL LOCATION AND DESIGNATION
- SB-21-08 — SOIL BORING LOCATION AND DESIGNATION
- SB-21-04 / SV-21-04 / F3 — SOIL BORING AND SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- SB-21-01 / MW-21-01 / SV-21-01 / G1 — SOIL BORING, MONITORING WELL AND SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- B-102 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY STANTEC, 2011)
- MR-09 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION PREVIOUSLY INSTALLED
- V-5 — SOIL VAPOR SAMPLING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
- RX-5 — SOIL BORING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
- G2 — WASTE CHARACTERIZATION SOIL BORING LOCATION AND DESIGNATION
- CATCH BASIN
- WASTE CHARACTERIZATION GRID
- SITE BOUNDARY

Parameter	NYSDEC UUSCO	NYSDEC RRSCO	NYSDEC PGWSCO	Units
VOCs				
1,2,4-Trimethylbenzene	**3.6**	52	3.6	mg/kg
Acetone	**0.05**	100	0.05	mg/kg
Benzene	**0.06**	4.8	0.06	mg/kg
Ethylbenzene	**1**	41	1	mg/kg
N-Butylbenzene	**12**	100	12	mg/kg
N-Propylbenzene	**3.9**	100	3.9	mg/kg
Xylenes, Total	**0.26**	100	1.6	mg/kg
SVOCs				
Benzo(A)Anthracene	**1**	1	1	mg/kg
Benzo(A)Pyrene	**1**	1	22	mg/kg
Benzo(B)Fluoranthene	**1**	1	1.7	mg/kg
Chrysene	**1**	3.9	1	mg/kg
Indeno(1,2,3-C,D)Pyrene	**0.5**	0.5	8.2	mg/kg
Metals				
Arsenic	**13**	16	16	mg/kg
Barium	**350**	400	820	mg/kg
Cadmium	**2.5**	4.3	7.5	mg/kg
Copper	**50**	270	1720	mg/kg
Lead	**63**	400	450	mg/kg
Mercury	**0.18**	0.81	0.73	mg/kg
Nickel	**30**	310	130	mg/kg
Zinc	**109**	10000	2480	mg/kg
PCBs				
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	mg/kg
Pesticides				
4,4'-DDE	**0.0033**	8.9	17	mg/kg
4,4'-DDT	**0.0033**	7.9	136	mg/kg
PFAS	NE	NE	NE	µg/kg

mg/kg – MILLIGRAMS PER KILOGRAM

µg/kg – MICROGRAMS PER KILOGRAM

NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SCO – SOIL CLEANUP OBJECTIVES

UUSCO – NYSDEC PART 375 UNRESTRICTED USE SCO

RRSCO – NYSDEC PART 375 RESTRICTED RESIDENTIAL USE SCO

PGWSCO – NYSDEC PART 375 PROTECTION OF GROUNDWATER SCO

– – NO NYSDEC PART 375 SOIL CLEANUP OBJECTIVES AVAILABLE

J – ESTIMATED VALUE

DUP – DUPLICATE SAMPLE

VOCS – VOLATILE ORGANIC COMPOUNDS

SVOCS – SEMIVOLATILE ORGANIC COMPOUNDS

PCBS – POLYCHLORINATED BIPHENYLS

PFAS – PER– AND POLYFLUOROALKYL SUBSTANCES

NE – NO EXCEEDANCE

ND – NO DETECTION

NA – NOT ANALYZED FOR BY LABORATORY

FT BLS – FEET BELOW LAND SURFACE

30' 0 30'

Title:

SOIL SAMPLE EXCEEDANCES

408 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: V.S.	Date: 11JAN22	PLATE
Prepared by: G.M.	Scale: AS SHOWN	1
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y138.02.DWG		

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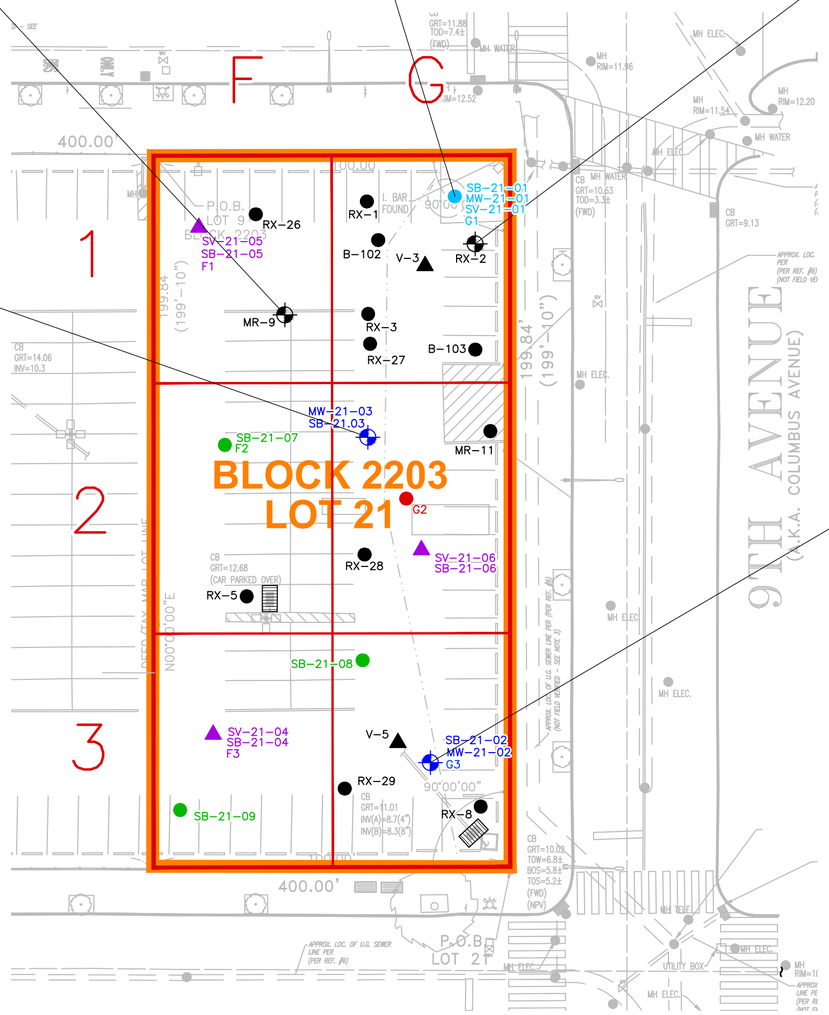
MR-9	08/02/2018
VOCs	
Chloroform	**8.2**
Metals, Total	
Iron	**857**
Magnesium	**40500**
Manganese	**424**
Selenium	**11.7**
Sodium	**615000**

MW-21-01	11/19/2021
VOCs	
Benzene	**23**
Ethylbenzene	**11**
Isopropylbenzene (Cumene)	**150**
m,p-Xylene	**7.4**
N-Butylbenzene	**17**
N-Propylbenzene	**230**
Sec-Butylbenzene	**12**
Xylenes	**8.9**
Metals, Total	
Iron	**20000**
Manganese	**2400**
Sodium	**261000**
Metals, Dissolved	
Manganese	**2290**
Sodium	**270000**
PFAS	
Perfluorooctanesulfonic acid (PFOS)	**7.4**
Perfluorooctanoic acid (PFOA)	**7.24**

RX-2	09/27/2018
VOCs	
Benzene	**54 J**
Ethylbenzene	**28**
Isopropylbenzene (Cumene)	**280**
m,p-Xylene	**7.1**
N-Butylbenzene	**45**
N-Propylbenzene	**740 J**
Sec-Butylbenzene	**28**
Toluene	**5.5**
Xylenes	**8.7**
SVOCs	
Naphthalene	**90**
Metals, Total	
Iron	**19400**
Lead	**209**
Magnesium	**46900**
Manganese	**726**
Sodium	**335000**



MW-21-03	11/19/2021	11/19/2021 DUP
Metals, Total		
Sodium	**557000**	**529000**
Metals, Dissolved		
Sodium	**491000**	**485000**
PFAS		
Perfluorooctanesulfonic acid (PFOS)	**7.23**	**7.3**
Perfluorooctanoic acid (PFOA)	**9.96**	**9.71**

MW-21-02	11/19/2021
Metals, Total	
Iron	**1430**
Magnesium	**35300**
Sodium	**592000**
Metals, Dissolved	
Magnesium	**35600**
Sodium	**644000**
PFAS	
Perfluorooctanesulfonic acid (PFOS)	**23.5**
Perfluorooctanoic acid (PFOA)	**31.2**

LEGEND

- SB-21-02 / MW-21-02 / G3 — SOIL BORING AND MONITORING WELL LOCATION AND DESIGNATION
- SB-21-08 — SOIL BORING LOCATION AND DESIGNATION
- SB-21-04 / SV-21-04 / F3 — SOIL BORING AND SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- SB-21-01 / MW-21-01 / SV-21-01 / G1 — SOIL BORING, MONITORING WELL AND SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- B-102 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY STANTEC, 2011)
- MR-09 — SOIL BORING AND TEMPORARY MONITORING WELL LOCATION AND DESIGNATION PREVIOUSLY INSTALLED
- V-5 — SOIL VAPOR SAMPLING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
- RX-5 — SOIL BORING LOCATION AND DESIGNATION PREVIOUSLY INSTALLED BY ROUX
- G2 — WASTE CHARACTERIZATION SOIL BORING LOCATION AND DESIGNATION
- CATCH BASIN
- WASTE CHARACTERIZATION GRID
- SITE BOUNDARY

Parameter	NYSDEC AWQSGV	Units
VOCs		
Benzene	**1**	µg/L
Chloroform	**7**	µg/L
Ethylbenzene	**5**	µg/L
Isopropylbenzene (Cumene)	**5**	µg/L
m,p-Xylene	**5**	µg/L
N-Butylbenzene	**5**	µg/L
N-Propylbenzene	**5**	µg/L
Sec-Butylbenzene	**5**	µg/L
Toluene	**5**	µg/L
Xylenes	**5**	µg/L
SVOCs		
Naphthalene	**10**	µg/L
Metals, Total		
Iron	**300**	µg/L
Lead	**25**	µg/L
Magnesium	**35000**	µg/L
Manganese	**300**	µg/L
Selenium	**10**	µg/L
Sodium	**20000**	µg/L
Metals, Filtered		
Iron	**300**	µg/L
Lead	**25**	µg/L
Magnesium	**35000**	µg/L
Manganese	**300**	µg/L
Selenium	**10**	µg/L
Sodium	**20000**	µg/L
PCBs	ND	ND
Pesticides	ND	ND
PFAS		
Perfluorooctanesulfonic acid (PFOS)	**2.7**	ng/L
Perfluorooctanoic acid (PFOA)	**6.7**	ng/L

ng/L – NANOGRAMS PER LITER

µg/L – MICROGRAMS PER LITER

NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AWQSGVs – AMBIENT WATER-QUALITY STANDARDS AND GUIDANCE VALUES

J – ESTIMATED VALUE

DUP – DUPLICATE SAMPLE

VOCs – VOLATILE ORGANIC COMPOUNDS

SVOCs – SEMIVOLATILE ORGANIC COMPOUNDS

PCBs – POLYCHLORINATED BIPHENYLS

PFAs – PER-AND POLYFLUOROALKYL SUBSTANCES

ND – NO DETECTION

50' 0 50'

Title:

GROUNDWATER SAMPLE EXCEEDANCES

408 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: V.S.	Date: 12JAN22	PLATE
Prepared by: G.M.	Scale: AS SHOWN	2
Project Mgr: V.S.	Project: 2477.0008Y000	
File: 2477.0008Y138.02.DWG		

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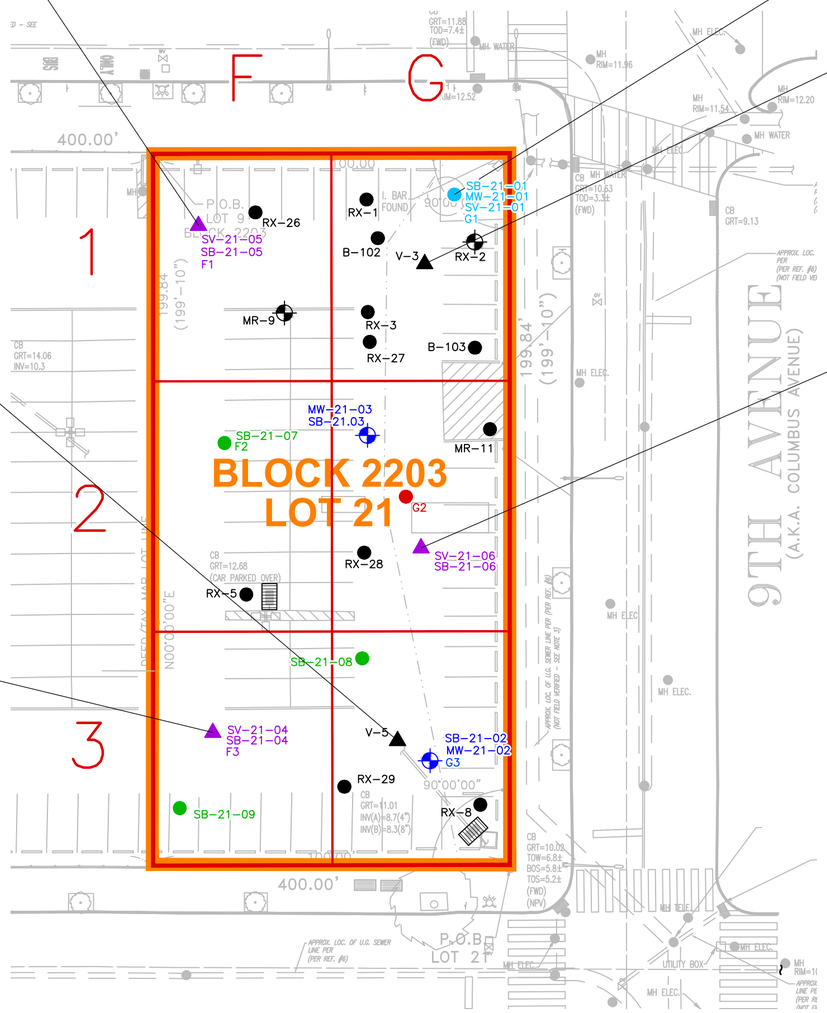
SV-21-05	11/16/2021	11/16/2021 DUP
VOCs		
1,2,4-Trimethylbenzene	**1**	**0.42 J**
1,3,5-Trimethylbenzene (Mesitylene)	**0.35 J**	ND
2,2,4-Trimethylpentane	**30**	**7.8**
2-Hexanone	**18**	**3.2**
4-Ethyltoluene	**0.27 J**	ND
Acetone	**95**	**30**
Benzene	**0.69**	**0.63 J**
Butane	**9.8**	**3.8**
Carbon Disulfide	**1.4 J**	**0.64 J**
Carbon Tetrachloride	ND	**0.35**
Chlorodifluoromethane	ND	**0.97 J**
Chloroform	**4.6**	**1.3**
Chloromethane	**0.44 J**	**1**
Cyclohexane	**0.57 J**	ND
Dichlorodifluoromethane	**1.8 J**	**2.3 J**
Ethylbenzene	**13**	**3.9**
m,p-Xylene	**47**	**15**
Methyl Ethyl Ketone (2-Butanone)	**350**	**38**
N-Heptane	**3.9**	ND
N-Hexane	**2.3**	ND
O-Xylene (1,2-Dimethylbenzene)	**15**	**4.3**
Tert-Butyl Alcohol	**6.5 J**	ND
Tetrachloroethylene (PCE)	**11**	**3**
Toluene	**42**	**15**
Trichlorofluoromethane	**1.1**	**1.2**

V-5	08/02/2018
VOCs	
1,1,1-Trichloroethane (TCA)	**6 J**
1,3-Butadiene	**13**
2,2,4-Trimethylpentane	**39**
Benzene	**8.6 J**
Butane	**170**
Carbon Disulfide	**21 J**
Chloroform	**27**
Cyclohexane	**14**
m,p-Xylene	**4.9 J**
Methyl Ethyl Ketone (2-Butanone)	**11 J**
N-Heptane	**160**
N-Hexane	**84**
Tetrachloroethylene (PCE)	**26**
Toluene	**1300**

SV-21-04	11/16/2021
VOCs	
1,2,4-Trimethylbenzene	**2**
1,3,5-Trimethylbenzene (Mesitylene)	**0.52 J**
1,3-Dichlorobenzene	**1.3**
2,2,4-Trimethylpentane	**2.9**
4-Ethyltoluene	**0.63 J**
Acetone	**47**
Benzene	**5.2**
Butane	**6.4**
Carbon Disulfide	**0.41 J**
Carbon Tetrachloride	**0.26**
Chlorobenzene	**0.32 J**
Chlorodifluoromethane	**1.1 J**
Chloroform	**0.4 J**
Chloromethane	**0.87 J**
Cyclohexane	**0.7**
Cymene	**0.25 J**
Dichlorodifluoromethane	**2.1 J**
Ethylbenzene	**1.7**
Isopropanol	**12**
m,p-Xylene	**5.6**
Methyl Ethyl Ketone (2-Butanone)	**63**
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	**2.2**
Methylene Chloride	**3.3**
N-Heptane	**13**
N-Hexane	**5.5**
N-Propylbenzene	**0.41 J**
O-Xylene (1,2-Dimethylbenzene)	**2.2**
Styrene	**0.41 J**
Tert-Butyl Alcohol	**4.5 J**
Tetrachloroethylene (PCE)	**0.91 J**
Toluene	**27**
Trichlorofluoromethane	**1.2**



SV-21-01	11/16/2021
VOCs	
1,2,4-Trimethylbenzene	**5.5 J**
2,2,4-Trimethylpentane	**10000**
Acetone	**380**
Benzene	**33**
Butane	**990**
Carbon Disulfide	**7.6 J**
m,p-Xylene	**14 J**
Methyl Ethyl Ketone (2-Butanone)	**130**
N-Hexane	**730**

V-3	08/02/2018
VOCs	
2,2,4-Trimethylpentane	**1100000**
Benzene	**5400 J**
Butane	**24000**
Cyclohexane	**11000**
Isopropylbenzene (Cumene)	**5300 J**
N-Heptane	**24000**
N-Hexane	**20000**
N-Propylbenzene	**4500 J**

SV-21-06	11/16/2021
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.42 J**
1,2,4-Trimethylbenzene	**1.1**
1,3,5-Trimethylbenzene (Mesitylene)	**0.29 J**
2,2,4-Trimethylpentane	**2.4**
4-Ethyltoluene	**0.34 J**
Acetone	**20**
Benzene	**1**
Butane	**7**
Carbon Disulfide	**3.1**
Carbon Tetrachloride	**0.32**
Chlorodifluoromethane	**0.98 J**
Chloroform	**0.67 J**
Chloromethane	**0.98 J**
Cyclohexane	**0.55 J**
Dichlorodifluoromethane	**2.2 J**
Ethylbenzene	**1.1**
Isopropanol	**6.4 J**
m,p-Xylene	**3.5**
Methyl Ethyl Ketone (2-Butanone)	**20**
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	**1.2 J**
N-Heptane	**8.9**
N-Hexane	**4.5**
O-Xylene (1,2-Dimethylbenzene)	**1.3**
Toluene	**6.7**
Trichlorofluoromethane	**1.1**

LEGEND

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CONCENTRATIONS IN ug/m³

ug/m³ – MICROGRAMS PER CUBIC METER

VOCs – VOLATILE ORGANIC COMPOUNDS

ND – COMPOUND WAS ANALYZED FOR BUT NOT DETECTED

50' 0 50'

Title:

SOIL VAPOR SAMPLE DETECTIONS

408 WEST 207TH STREET
NEW YORK, NEW YORK

Prepared for:

HARLEM RIVER NINTH AVENUE DEVELOPMENT LLC

ROUX

Compiled by: V.S.	Date: 12JAN22	PLATE 3
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