

REMEDIAL INVESTIGATION WORK PLAN
FORMER TILSDALE LUMBER AND COAL REDEVELOPMENT SITE
NYSDEC BCP SITE NO. C241295
8-01 AND 8-51 26TH AVENUE
QUEENS, NEW YORK

by
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New York, New York

for
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Newark, New Jersey

File No. 0211417
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Certification

I, James M. Bellew, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with the applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10).


James M. Bellew

January 9, 2026

Date

Table of Contents

	Page
<i>Certification</i>	i
List of Tables	iv
List of Figures	iv
List of Appendices	iv
List of Acronyms and Abbreviations	v
1. Introduction	1
1.1 PURPOSE	1
2. Background	3
2.1 CURRENT LAND USE	3
2.2 SITE HISTORY	3
2.3 SURROUNDING LAND USE	3
2.4 SURROUNDING LAND USE HISTORY	3
2.5 PREVIOUS INVESTIGATIONS	4
3. Remedial Investigation	9
3.1 UTILITY MARKOUT	9
3.2 SOIL SAMPLING	9
3.3 GROUNDWATER SAMPLING	10
3.4 INVESTIGATION-DERIVED WASTE	11
3.5 SOIL VAPOR SAMPLING	12
3.6 PROPOSED SAMPLING RATIONALE	12
4. Green and Sustainable Remediation and Climate Resiliency	13
4.1 BEST PRACTICES AND TECHNIQUES	13
4.2 REPORTING	14
4.3 CLIMATE RESILIENCY EVALUATION	14
4.4 ENVIRONMENTAL FOOTPRINT ANALYSIS	14
5. Quality Assurance and Quality Control	15
6. Data Use	16
6.1 DATA SUBMITTAL	16
6.2 DATA VALIDATION	16
7. Project Organization	17

8.	Health and Safety	18
8.1	HEALTH AND SAFETY PLAN	18
8.2	COMMUNITY AIR MONITORING PLAN	18
8.3	QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT	18
9.	Reporting	20
10.	Schedule	21
	References	22

List of Tables

Table No.	Title
1	Sampling and Analysis Plan

List of Figures

Figure No.	Title
1	Project Locus
2	Proposed Sample Location Map
3	Surrounding Land Use Map
4	Summary of Historical Soil Analytical Data
5	Summary of Historical Groundwater Data
6	Summary of Historical Soil Vapor Analytical Data

List of Appendices

Appendix	Title
A	Previous Reports
B	Field Sampling Plan
C	Quality Assurance Project Plan
D	NYSDEC Emerging Contaminant Field Sampling Guidance
E	Climate Screening Checklist
F	Green Sustainable Remediation Documents
G	Health and Safety Plan
H	NYSDOH CAMP Guidance Document
I	Fish and Wildlife Resource Impact Analysis Decision Key

List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
µg/L	micrograms per liter
µg/m ³	micrograms per cubic meter
Alpha	Alpha Analytical
ASP	Analytical Service Protocol
AWQS	Ambient Water Quality Standards
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CAMP	Community Air Monitoring Plan
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CUSCO	Commercial Use Soil Cleanup Objectives
CVOCs	chlorinated volatile organic compounds
DER	Division of Environmental Remediation
DER-10	Division of Environmental Remediation-10 (<i>specifically “May 2010 NYSDEC Technical Guidance for Site Investigation and Remediation”</i>)
DER-31	Division of Environmental Remediation-31
DUSR	Data Usability Summary Report
EA	exposure assessment
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Approval Program
ESA	Environmental Site Assessment
FSP	Field Sampling Plan
ft	feet/foot
GEI Consultants	GEI Consultants, Inc., P.C.
GPR	Ground-penetrating radar
Haley & Aldrich of New York	H & A of New York Engineering and Geology, LLP
HASP	Health and Safety Plan
HREC	Historic Recognized Environmental Condition
L/min	liters per minute
Lakewood	Lakewood Environmental Services Corporation
LSDF	low-sulfur diesel fuel
mg/kg	milligrams per kilogram
NAVD88	North American Vertical Datum of 1988
Nova	Nova Geophysical Services, LLC
NTU	nephelometric turbidity unit
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
OSHA	Occupational Safety and Health Administration

List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
PFAS	per- and poly-fluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
ppm	parts per million
QA/QC	Quality Assurance / Quality Control
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAWP	Remedial Action Work Plan
RECs	Recognized Environmental Conditions
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
RRSCOs	Restricted Residential Use Soil Cleanup Objectives
SEFA	Spreadsheets for the Environmental Footprint Analysis
Site	Former Tilsdale Lumber and Coal Redevelopment Site located at 8-01 and 8-51 26th Avenue in Queens, New York
sq ft	square feet/square foot
SVOCs	semi-volatile organic compounds
TAL	Total Analyte List
TCE	trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	U.S. Environmental Protection Agency
UUSCOs	Unrestricted Use Soil Cleanup Objectives
VOCs	volatile organic compounds
Volunteer	KS Astoria LLC

1. Introduction

On behalf of the Volunteer, KS Astoria LLC, H & A of New York Engineering and Geology, LLP (Haley & Aldrich of New York) has prepared this Remedial Investigation Work Plan (RIWP) for the Former Tiltsdale Lumber and Coal Redevelopment Site located at 8-01 and 8-51 26th Avenue in Queens, New York (Site). This RIWP was prepared in accordance with the regulations and guidance applicable to the Brownfield Cleanup Program (BCP).

The Site, identified as Block 906, Lots 1 and 5 on the New York City tax map, is currently an open, undeveloped lot used by several contractors for storage of equipment and materials. The Site encompasses approximately 1.598 acres (69,616 square feet [sq ft]). The Site is bounded to the north by the East River; to the east by a 23-story multi-family building and two three-story, one- and two-family residences; to the south by an unimproved section of 26th Avenue followed by an active construction site (proposed Buildings 4 and 5); and to the west by an open, unimproved lot followed by two one-story industrial use buildings. The Site location is shown on Figure 1. Existing Site features are shown on Figure 2, and the surrounding land use is depicted on Figure 3.

According to the New York City Planning Commission Zoning Map 9a, the Site is located within a residential zoning district (R7-3) with a commercial overlay (C2-4). The proposed development of this property is consistent with the current zoning. The Site has been assigned an E-Designation (E-343) for hazardous materials and air quality as part of the Astoria Cove Rezoning (City Environmental Quality Review [CEQR] Project No.13DCP127Q).

The planned project will consist of constructing a new eight-story residential building and one cellar level as Building 3A and a new 26-story residential tower atop an eight- to 10-story residential podium and one cellar level as Building 3B. The area to the west of the buildings will be developed as the 8th Street Mews, a public access area. The area to the north of the buildings will be developed as a paved pedestrian walkway. The areas to the south and east of the buildings will be finished with sidewalks. The new development is anticipated to extend approximately 10 feet (ft) below ground surface (bgs) to an elevation (El.) of 8.5 ft North American Vertical Datum of 1988 (NAVD88) and is consistent with current zoning.

1.1 PURPOSE

The objective of the Remedial Investigation (RI) is to characterize the nature and extent of environmental impacts at the Site and to provide sufficient information to evaluate remedial alternatives, as required. Based on previous investigations conducted at the Site in December 2014, February 2020, and January 2022, the primary contaminants of concern for the Site include:

- volatile organic compounds (VOCs), specifically chlorinated volatile organic compounds (CVOCs); semi-volatile organic compounds (SVOCs), specifically polycyclic aromatic hydrocarbons (PAHs); metals, including lead, mercury, and trivalent chromium; pesticides; polychlorinated biphenyls (PCBs); and per- and polyfluoroalkyl substances (PFAS) in soil;
- CVOCs, SVOCs, PCBs, and PFAS in groundwater; and

- CVOCs in soil vapor.

Historical soil, groundwater, and soil vapor analytical data collected at the Site are provided in Figures 4, 5, and 6, respectively.

The previous investigations did not comprehensively delineate the extent of soil, groundwater, and soil vapor contamination at the Site; therefore, additional targeted soil, groundwater, and soil vapor sampling are proposed. The RI will be implemented upon approval of this RIWP. Results of the additional sample analyses proposed in this RIWP will be used to confirm the results of the previous Site characterization activities, delineate any on-Site source(s), address data gaps, and determine a course for remedial action. In addition, a qualitative exposure assessment will be conducted and will consider the nature of populations currently exposed or that have the potential to be exposed to Site-related contaminants both on and off Site, along with describing the reasonably anticipated future land use of the Site and affected off-Site areas.

2. Background

2.1 CURRENT LAND USE

The Site, identified as Block 906, Lots 1 and 5 on the New York City tax map, is currently an open, undeveloped lot used by several contractors for storage of equipment and materials. The Site encompasses approximately 1.598 acres (69,616 sq ft). The Site location is shown on Figure 1.

2.2 SITE HISTORY

According to historical Sanborn Fire Insurance Maps, the Site was first developed in the late 1890s. Lot 1 was improved with a dwelling, and Lot 5 was improved with a lumber shed, a coal bin, coal pockets, a small office, and a dwelling operated by “Tiltsdale Lumber & Coal Yard.” By 1915, the dwelling on Lot 1 was razed and replaced with lumber piles and occupied by “Tiltsdale Lumber & Coal Yard.” During that time, Lot 5 was improved with coal pockets, lumber piles, a lumber shed, and multiple storage buildings. By 1948, the lumber yard structures were replaced with a large industrial building on Lot 5 and a smaller building on Lot 1, which were attached to the west-adjacent buildings operated by “Morey Machinery Co. Inc.,” a machine shop. The building on Lot 5 was utilized for assembly, and the building on Lot 1 was utilized for heat treatment, grinding, and storage. By 1981, the same structures were depicted on the Sanborn Fire Insurance Maps, but the buildings were occupied by “Superstud Superior Steel Stud Manufacturing.” From the 1990s to 2006, both lots remained unchanged. The buildings were demolished in 2023.

The current property owner, 2030 Astoria Developers, LLC, purchased the Site in August 2014. KS Astoria, LLC is in contract negotiations to purchase the Site.

2.3 SURROUNDING LAND USE

The Site is located between 9th Street and 4th Street, bounded by 26th Avenue to the southwest within an urban area of the Astoria neighborhood of Queens, New York. The area surrounding the Site consists of low-rise commercial and industrial buildings, multi-story residential apartment buildings, and one- and two-family homes. There are no sensitive receptors within a 500-ft radius of the Site. Properties immediately surrounding the Site are in R6 and R7A zoning districts with C2-4 commercial overlays.

2.4 SURROUNDING LAND USE HISTORY

The area surrounding the Site was historically used for industrial and manufacturing purposes, including timber storage, leather manufacturing, marble and stone working, and stud manufacturing from the late 1800s through 2019. By 1991, the east-adjacent property was improved with a condominium complex.

2.5 PREVIOUS INVESTIGATIONS

To date, the following investigations have been performed at the Site:

1. June 2020, *Astoria Cove Additional Subsurface Sampling*, prepared by GEI Consultants, Inc., P.C. (GEI Consultants)
2. April 2022, *Remedial Investigation Report (RIR)*, prepared by GEI Consultants
3. December 2023, *Geotechnical Report*, prepared by GEI Consultants
4. March 2025, *Phase I Environmental Site Assessment (ESA)*, prepared by Haley & Aldrich of New York

Full investigation findings are included in Appendix A. A summary of environmental findings of these investigations is provided below.

June 2020, *Astoria Cove Additional Subsurface Sampling*, prepared by GEI Consultants

This report summarizes the data and findings of an additional subsurface investigation performed at the subject property, referred to as the Phase 2 development area, and the surrounding Phase 1, 3, and 4 development areas between February and June 2020.

A total of 12 geotechnical soil borings (B-12 through B-23) were completed at the subject property. The soil borings were generally advanced to 75 to 100 ft bgs, or approximately 10 ft into bedrock. One of these borings (B-16) was finished as a well to obtain depth to water readings. Soil samples were collected from five of the borings (B-15, B-16, B-21, B-22, and B-23) based on visual and olfactory findings and photoionization detector (PID) screening results. Samples were analyzed for Target Compound List (TCL), VOCs, SVOCs, PCBs, pesticides, herbicides, and Target Analyte List (TAL) metals. The analytical data were compared to Title 6 of the New York Codes, Rules, and Regulations (6NYCRR) Part 375 6.8 Unrestricted Use Soil Cleanup Objectives (UUSCOs), Restricted Residential Use Soil Cleanup Objectives (RRSCOs), and Commercial Use Soil Cleanup Objectives (CUSCOs).

Urban fill was encountered throughout the subject property and ranged in thickness from 2 ft to a maximum of 23 ft in the northern portion of the subject property. Visual and olfactory impacts, including petroleum-like odors and black soil staining and elevated PID readings, were identified in the northern portion of the Site from the surface down to approximately 22 ft bgs. SVOCs exceeding UUSCOs and RRSCOs, and metals and PCBs exceeding UUSCOs, were identified in the southeast portion of the Site. VOCs and pesticides exceeding UUSCOs were identified in the soil in the northern portion of the Site.

April 2022, *RIR*, prepared by GEI Consultants

GEI Consultants performed an RI at Block 906, Lots 1 and 5; a small portion of Block 907, Lot 1 (proposed Building 3A and 3B; the Site); Block 909, Lot 35 (proposed Building 4); and Block 908, Lot 12 (proposed Building 5) between January and February 2022 to provide information sufficient for establishing remedial action objectives, evaluating remedial actions, and selecting a remedy. The investigation included a geophysical survey, installation of nine soil borings (SB-100 through SB-108) across the

subject property to collect 18 soil samples, four groundwater monitoring wells (MW-1 through MW-4) to collect four samples, and six soil vapor probes (SV-1 through SV-6) to collect six samples. Soil samples were analyzed for VOCs, SVOCs, TAL metals, pesticides, PCBs, 1,4-dioxane, and PFAS. Groundwater samples were analyzed for VOCs, SVOCs, TAL metals, pesticides, PCBs, 1,4-dioxane, and PFAS. Soil vapor samples were analyzed for VOCs.

Field observations and laboratory analytical results are summarized below:

- The stratigraphy from the Site, from the surface down, consists of historic fill material to a depth of 5 to 10 ft underlain by glacial sands and gravel to the termination depth of the borings. The historic fill generally consisted of sand with silt and gravel containing brick and concrete fragments. No visual impacts (e.g., staining, odors, sheens, etc.) were identified, and no PID readings above background were noted. Depth to bedrock was encountered at a previous geotechnical investigation at approximately 75 to greater than 100 ft bgs. The depth to groundwater at the Site ranges between 10 to 20 ft in the northern portion of the subject property and generally flows from south to north beneath the Site towards the East River.
- Soil/fill samples collected during the RI were compared to the 6NYCRR Part 375-6.8 UUSCOs and the RRSCOs. Soil results for proposed Building 3A and Building 3B are summarized below:
 - VOCs, including acetone (maximum of 0.12 milligrams per kilogram [mg/kg]), tetrachloroethene (PCE; maximum of 38 mg/kg), and trichloroethene (TCE; 0.86 mg/kg) were detected at concentrations exceeding UUSCOs. Of these VOCs, PCE was also detected at concentrations above RRSCOs.
 - SVOCs, including benzo(a)anthracene (maximum of 3.4 mg/kg), benzo(a)pyrene (maximum of 2.9 mg/kg), benzo(b)fluoranthene (maximum of 4.2 mg/kg), benzo(k)fluoranthene (1.2 mg/kg), chrysene (maximum of 3.1 mg/kg), dibenzo(a,h)anthracene (0.38 mg/kg), and indeno(1,2,3-cd)pyrene (maximum of 2 mg/kg) were detected at concentrations exceeding their UUSCOs. Of these SVOCs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were also detected at concentrations exceeding their RRSCOs.
 - Pesticides, including 4,4'-DDE (0.00562 mg/kg), 4,4'-DDD (0.0072 mg/kg), and 4,4'-DDT (0.0233 mg/kg) were detected at concentrations exceeding their UUSCOs.
 - PCBs, including Aroclor 1248 (maximum of 3.21 mg/kg), Aroclor 1254 (3.44 mg/kg), Aroclor 1260 (0.117 mg/kg), Aroclor 1268 (1.22 mg/kg), and total PCBs (maximum of 3.44 mg/kg) were detected at concentrations exceeding their UUSCOs. Of these PCBs, Aroclor 1248, Aroclor 1254, Aroclor 1268, and total PCBs were also detected at concentrations exceeding their RRSCOs.
 - Metals, including copper (maximum of 156 mg/kg), lead (maximum of 168 mg/kg), mercury (maximum of 1.45 mg/kg), nickel (140 mg/kg), trivalent chromium (maximum of 220 mg/kg), and zinc (maximum of 265 mg/kg) were detected at concentrations exceeding their UUSCOs. Of these metals, mercury and trivalent chromium were also detected at concentrations exceeding their RRSCOs.
 - Emerging contaminants, including perfluorooctanoic acid (PFOA) (0.000046 mg/kg), perfluorooctanesulfonic acid (PFOS) (0.00128 mg/kg), and perfluoroundecanoic acid

(PFUnA) (0.000059 mg/kg) were detected in the soil samples. 1,4-dioxane was not detected in any of the soil samples.

- Groundwater samples collected during the RI were compared to the New York State 6NYCRR Part 703.5 Class GA Ambient Water Quality Standards (AWQS). Groundwater results for Building 3A and Building 3B are summarized below:
 - No pesticides were detected at concentrations above their AWQS.
 - VOCs, including PCE (11 micrograms per liter [$\mu\text{g/L}$]) and TCE (maximum of 13 $\mu\text{g/L}$), were detected at concentrations exceeding their AWQS.
 - SVOCs, including benzo(a)anthracene (maximum of 0.54 $\mu\text{g/L}$), benzo(a)pyrene (maximum of 0.56 $\mu\text{g/L}$), benzo(b)fluoranthene (maximum of 0.77 $\mu\text{g/L}$), benzo(k)fluoranthene (maximum of 0.2 $\mu\text{g/L}$), chrysene (maximum of 0.45 $\mu\text{g/L}$), indeno(1,2,3-cd)pyrene (maximum of 0.47 $\mu\text{g/L}$), and phenol (maximum of 3.9 $\mu\text{g/L}$), were detected at concentrations exceeding their AWQS. Phenol was detected in the field blank sample (FB-020222) at a concentration of 2.4 $\mu\text{g/L}$, which is above the AWQS of 1 $\mu\text{g/L}$.
 - PCBs, including Aroclor 1248 (1.01 $\mu\text{g/L}$), Aroclor 1254 (1.13 $\mu\text{g/L}$), Aroclor 1260 (0.145 $\mu\text{g/L}$), and total PCBs (2.29 $\mu\text{g/L}$), were detected at concentrations exceeding their AWQS.
 - Dissolved metals, including magnesium (maximum of 494,000 $\mu\text{g/L}$), manganese (1,124 $\mu\text{g/L}$), and sodium (maximum of 4,410,000 $\mu\text{g/L}$) were detected at concentrations exceeding their AWQS.
 - Emerging contaminants, including perfluorobutanoic acid (PFBA) (maximum of 0.0131 $\mu\text{g/L}$), perfluoropentanoic acid (PFPeA) (maximum of 0.0204 $\mu\text{g/L}$), perfluorobutanesulfonic acid (PFBS) (maximum of 0.00727 $\mu\text{g/L}$), perfluorohexanoic acid (PFHxA) (maximum of 0.0227 $\mu\text{g/L}$), perfluoroheptanoic acid (PFHpA) (maximum of 0.0157 $\mu\text{g/L}$), perfluorohexanesulfonic acid (PFHxS) (maximum of 0.0272 $\mu\text{g/L}$), PFOA (maximum of 0.0409 $\mu\text{g/L}$), perfluoroheptanesulfonic acid (PFHpS) (maximum of 0.00638 $\mu\text{g/L}$), perfluorononanoic acid (PFNA) (0.0026 $\mu\text{g/L}$), PFOS (maximum of 0.038 $\mu\text{g/L}$), perfluorodecanoic acid (PFDA) (0.00081 $\mu\text{g/L}$), perfluorotetradecanoic acid (PFTA) (0.000508 $\mu\text{g/L}$), and 1,4-dioxane (maximum of 0.425 $\mu\text{g/L}$), were detected in the groundwater samples.
- Soil vapor samples collected during the RI were compared to the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion matrices dated October 2006. Soil vapor results are summarized below:
 - Soil vapor results indicated low levels of petroleum-related VOCs and elevated levels of CVOCs.
 - The total concentration of petroleum-related VOCs (benzene, toluene, ethylbenzene, and xylenes [BTEX]) ranged from 2.449 micrograms per cubic meter ($\mu\text{g/m}^3$) to 14.9 $\mu\text{g/m}^3$.
 - CVOCs, including 1,1,1-trichloroethane (ranging from 7.15 $\mu\text{g/m}^3$ to 606 $\mu\text{g/m}^3$), methylene chloride (2.48 $\mu\text{g/m}^3$), and TCE (23.2 $\mu\text{g/m}^3$), were detected in the soil vapor

samples. Other CVOCs, including carbon tetrachloride, PCE, and vinyl chloride, were not detected in any of the soil vapor samples.

- Acetone was detected in the soil vapor samples ranging from 69.8 $\mu\text{g}/\text{m}^3$ to 3,470 $\mu\text{g}/\text{m}^3$. Acetone is a common laboratory contaminant.

December 2023, *Geotechnical Report*, prepared by GEI Consultants

GEI Consultants completed a subsurface investigation to investigate subsurface conditions at the subject property (Buildings 3A/3B) and surrounding proposed development areas (Buildings 4 and 5) and present recommendations for foundations and other geotechnical aspects of design and construction. The geotechnical subsurface investigation tasks included:

- Engaging a test boring contractor to drill 27 geotechnical test borings and install six observation wells in support of Buildings 3A/3B, Building 4, and Building 5 for geotechnical design (borings B12 through B23, B101, and B102 are located on the Site);
- Performing split spoon sampling and cumulatively collected about 68 ft of rock cores;
- Evaluating soil and rock samples recovered from the test borings and preparing test boring logs; and
- Performing geotechnical index testing on soil samples from the test borings.

The following observations were made during the investigation:

- The stratigraphy at the subject property consists of pavement and fill underlain by native loose sand, followed by a discontinuous clay layer, a sand layer, till, decomposed/weathered rock then bedrock.
- Fill was identified at all exploration locations completed at the Site to depths between 2 to 10 ft bgs. The fill generally consisted of brown silty sand with varying amounts of glass, wood, bricks, and other construction debris.
- Groundwater levels were gauged in the observation wells installed in geotechnical test borings in March 2020: B5 (OW), B8 (OW), B16 (OW), B29(OW), and B53 (OW). B16(OW), located within the Site, had a groundwater level reading of 17.3 ft bgs (El. 4 ft [NAVD88]). In February 2022, four temporary wells (MW-1 through MW-4) were installed at the Site and subsequently gauged. Groundwater level readings ranged from approximately 11.3 to 17.6 ft bgs (El. 1.1 to 2 ft [NAVD88]).

March 2025, Phase I ESA, prepared by Haley & Aldrich of New York

The Phase I ESA prepared by Haley & Aldrich of New York revealed two Recognized Environmental Conditions (RECs) in connection with the Site associated with the former uses of the Site and documented contamination in soil, groundwater, and soil vapor. The Site was historically used for industrial and manufacturing purposes since the late 1800s. Manufacturing and dry cleaning facilities commonly utilize hazardous materials, including petroleum products and chlorinated solvents. The historical uses of the Site and adjacent properties are considered a REC, as potential or undocumented releases of petroleum products, solvents, and/or other hazardous materials may have adversely

affected groundwater, soil, and/or soil vapor at the Site. A subsurface investigation performed by GEI Consultants from February to June 2020 identified contamination in soil, including SVOCs, metals, and PCBs, at the Site. A RI performed by GEI Consultants in January and February 2022 at the Site identified heavy metals, PFAS, CVOCs, SVOCs, PCBs, and pesticides in soil; heavy metals, PFAS, and CVOCs in groundwater; and VOCs and CVOCs in soil vapor. The presence of fill material was observed in both investigations to depths of 5 to 20 ft bgs. Documented subsurface contamination at the Site is considered a REC. Additionally, the Phase I ESA revealed one Historical Recognized Environmental Condition (HREC) in connection with the Site associated with a listing in the NY Spills database. According to the database, spill number 9602429 occurred on the Site on May 20, 1996, due to a fire at the former Superstud Superior Steel Stud Manufacturing facility. This spill resulted in an unknown quantity of limestone runoff discharged into the East River. This spill is considered an HREC because the case was closed by the New York State Department of Environmental Conservation (NYSDEC) on May 21, 1996.

3. Remedial Investigation

This section describes the field activities to be conducted during the RI and provides the sampling scope, objectives, methods, anticipated number of samples, and sample locations. The following activities will be conducted to fill data gaps and determine the nature and extent of contamination at the Site.

3.1 UTILITY MARKOUT

A geophysical survey will be performed across accessible areas of the Site prior to the commencement of any ground-intrusive activities. The ground-penetrating radar (GPR) scan will potentially identify any underground structures in areas that were previously inaccessible in preparation for the proposed sampling work. It is noted that borings may be adjusted based on the results of the GPR scan, and any adjustments to the locations presented below will be communicated to the NYSDEC. Field personnel will mobilize to the Site to mark out (with flagging or paint) the proposed soil sample locations. Prior to mobilization, 811-Dig Safe New York will be contacted to mark public underground utilities. If necessary, the adjacent property owners and/or private vendors will be contacted for assistance with marking out utilities. Once the utilities are marked, field equipment and personnel will be mobilized to the Site.

3.2 SOIL SAMPLING

To further characterize surface soil conditions, additional on-Site soil samples will be collected to meet NYSDEC Division of Environmental Remediation (DER)-10 requirements for RIs. The sampling and analysis plan is summarized in Table 1. Proposed sample locations are presented on Figure 2.

As part of this RI, a total of 20 soil borings will be installed to 20 ft bgs (or 5 ft into the water table, whichever is deeper, if the soil boring is converted to a monitoring well) by a track-mounted direct-push drill rig (Geoprobe®), or other drilling technology as needed, operated by a licensed operator. Soil samples will be collected from dedicated acetate liners using a stainless-steel trowel or sampling spoon. Samples will be collected using laboratory-provided clean bottle ware. VOC grab samples will be collected using Terra core® or En Core® samplers.

Soils will be logged continuously by a geologist or engineer using a Modified Burmeister Soil Classification System. The presence of staining, odors, and PID readings will be noted. Sampling methods are described in the Field Sampling Plan (FSP) provided as Appendix B. A Quality Assurance Project Plan (QAPP) is provided as Appendix C. Laboratory data will be reported in Analytical Services Protocol (ASP) Category B deliverable format.

Soil samples representative of Site conditions will be collected at 20 locations widely distributed across the Site, as shown in Figure 2. Up to three grab samples will be collected from each boring. One surface sample will be collected from the top 0 to 2 ft immediately beneath the impervious Site cover (i.e., surface soils) at each location. A second sample will be collected at an intermediate depth within the historic fill layer (estimated at 4 to 6 ft bgs, but subject to field observation), and a third sample will be collected from immediately below the proposed development depth of 10 ft bgs, or the two-foot interval above the observed groundwater table, whichever is shallower. The number of samples collected during the RI may vary based on field conditions.

Soil samples will be analyzed for:

- TCL VOCs using United States Environmental Protection Agency (USEPA) Method 8260D;
- TCL SVOCs using USEPA Method 8270E;
- TAL metals (including total and hexavalent chromium and cyanide) using USEPA Method 6020B;
- PCBs using USEPA Method 8082A;
- TCL pesticides using USEPA Method 8081B;
- PFAS by USEPA Method 1633A;
- 1,4-dioxane by USEPA Method 8270E SIM; and
- Total and Toxicity Characteristic Leaching Procedure (TCLP) lead using USEPA method 6010B.

Samples to be analyzed for PFAS will be collected and analyzed in accordance with the NYSDEC-issued April 2023 “Sampling, Analysis, and Assessment of PFAS Under NYSDEC’s Part 375 Remedial Programs.” As needed, additional samples may be collected to satisfy waste characterization analytical needs for facilities located in neighboring states.

In addition, delineation soil sampling for elevated lead will be conducted at B-15, B-21, and SB-106, where total lead was greater than 100 parts per million (ppm) during previous sampling events. Soil samples will be collected from the same locations and depths as these select locations and will be analyzed for total and TCLP lead. Soil borings advanced at these locations will be indicated with an “_D” following their original nomenclature, as shown in Figure 2. Additionally, soil boring B-15_D will be advanced to 20 ft bgs and up to three soil samples will be collected according to the intervals and analyses above and listed on Table 1.

3.3 GROUNDWATER SAMPLING

The purpose of the groundwater sampling is to obtain current groundwater data and analyze for additional parameters (i.e., PFAS and 1,4-dioxane) to meet NYSDEC DER-10 requirements for RIs. Groundwater flow is presumed to flow from the south to the north.

Up to 11, 2-inch permanent monitoring wells will be installed to approximately 25 ft bgs or to at least 8 ft below the groundwater interface (if encountered at a shallower depth) by a track-mounted direct-push drill rig (Geoprobe®), or other drilling technology as needed, operated by a licensed operator. Monitoring wells will be screened to straddle the groundwater interface, assumed to be encountered between approximately 11 to 17 ft bgs. Monitoring wells will consist of 10 feet of screen, extending at least 3 feet above the observed groundwater interface for tidal influence and groundwater elevation changes, with the remaining section of the well constructed of solid riser to grade surface. The wells will have a 2-inch annular space and be installed using #2 certified clean sand fill to a depth of 2 ft above the screen. A bentonite seal will be placed above the sand pack for each well, and the remainder of the borehole will be filled with bentonite grout. Each monitoring well will be completed using locking gate boxes, flush with grade. The groundwater interface depth will be evaluated during initial work on the implementation of this RI in order to establish the proper range of well screening in the field. Observations will be communicated with NYSDEC daily in field reports, further detailed in Section 9.

Monitoring wells will be developed after installation by surging a pump in the well several times to pull fine-grained material from the well. Development will be completed until the water turbidity is 50 nephelometric turbidity units (NTU) or less, or 10 well volumes are removed, if possible. Groundwater sampling will occur at a minimum of one week after monitoring well installation and development. The well casings will be surveyed by a New York State-licensed surveyor and gauged during a round of synoptic groundwater depth readings to facilitate the preparation of a groundwater contour map and to determine the direction of groundwater flow.

The sampling and analysis plan is summarized in Table 1. Proposed and previous monitoring well locations (former temporary well points and geotechnical monitoring wells) are provided in Figure 2. Proposed locations will be dependent on field observation and will be communicated with NYSDEC in daily reporting. Any previously installed monitoring wells will not be sampled due to unconfirmed well construction details.

Monitoring wells will be sampled and analyzed for:

- TCL VOCs using USEPA Method 8260D;
- TCL SVOCs using USEPA Method 8270E;
- Total and dissolved metals using USEPA Method 6020B;
- PCBs using USEPA Method 8082A;
- TCL pesticides using USEPA Method 8081B;
- PFAS using USEPA Method 1633A; and
- 1,4-dioxane using USEPA Method 8270E SIM isotope dilution.

Samples to be analyzed for PFAS will be collected and analyzed in accordance with the NYSDEC-issued April 2023 “Sampling, Analysis and Assessment of PFAS.”

Groundwater wells will be sampled using low-flow sampling methods described in the FSP. Following the low-flow purge, samples will be collected from monitoring wells for analysis of the analytes mentioned above. Groundwater sampling will be conducted at least one week after monitoring well development.

The FSP presented in Appendix B details field procedures and protocols that will be followed during field activities. The QAPP presented in Appendix C details the analytical methods and procedures that will be used to analyze samples collected during field activities. PFAS sampling at each monitoring well will be conducted following the purge and sampling method detailed in the NYSDEC guidance documents (see Appendix D).

3.4 INVESTIGATION-DERIVED WASTE

Following sample collection, leftover soil cuttings will be stored in 5-gallon buckets, and any boreholes that are not converted to monitoring wells will be backfilled with soil cuttings to within 24 inches of the surface, in accordance with DER-10 Section 3.3 (e)(1)(ii), and an upper bentonite plug to grade.

Boreholes will be restored to grade with the surrounding area. If soil is observed to have visual or olfactory impacts, it will be separated and placed into a sealed and labeled New York State Department of Transportation (NYSDOT)-approved 55-gallon drum pending characterization and off-Site disposal. Groundwater purged from the monitoring wells during development and sample collection will be placed into a NYSDOT-approved 55-gallon drum pending off-Site disposal.

3.5 SOIL VAPOR SAMPLING

Samples will be collected in accordance with the NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, October 2006). Eleven soil vapor probes will be installed to 1 to 2 ft above the groundwater interface (between 11 to 18 ft bgs). The vapor implants will be installed with a direct-push drilling rig (e.g., Geoprobe®) to advance a stainless-steel probe to the desired sample depth. Sampling will occur for the duration of two hours.

Samples will be collected in appropriately sized Summa® canisters that have been certified clean by the laboratory, and samples will be analyzed using USEPA Method TO-15. Flow rate for both purging and sampling will not exceed 0.2 liters per minute (L/min). The soil vapor sampling and analysis plan is summarized in Table 1. Proposed soil vapor point locations are provided in Figure 2. Sampling methods are described in the FSP provided as Appendix B.

3.6 PROPOSED SAMPLING RATIONALE

Haley & Aldrich of New York has proposed the sample plan described herein and as shown in Figure 2, in consideration of the data generated during the previous investigations conducted at the Site. Previous investigations left data gaps throughout the Site, including a lack of analytical data for potentially high-risk areas that may have been impacted during historical Site operations. To properly characterize the Site and identify potential source areas, all phases of media will be comprehensively investigated as part of this RI, and data gaps will be evaluated.

Sampling locations have been proposed to investigate areas of the Site with identified data gaps. Proposed sampling locations will include groundwater, soil, and soil vapor sampling to address data gaps and confirm if there is an on-Site source of contamination. Results of previous investigations have also been reviewed and taken into account while developing the proposed sampling plan.

The Proposed Sample Location Map (included as Figure 2) is designed to generate sufficient data to identify the source of contamination and classify subsurface conditions throughout the Site as a whole.

4. Green and Sustainable Remediation and Climate Resiliency

The work completed as part of this work plan will comply with all NYSDEC guidance documents, including DER-31: Green Remediation (NYSDEC, 2011). To ensure compliance with DER-31, the work will be completed using the best practices and techniques described below. Specific reporting methods relative to DER-31 are further described below.

4.1 BEST PRACTICES AND TECHNIQUES

DER-31 provides examples of best practices and techniques that could be applied during all phases of remediation (Attachment 1 of the DER-31 policy). In addition, the techniques identified below will be implemented at sites unless a site-specific evaluation demonstrates impracticability or favors an alternative green approach:

Practice/Technique	Potential Benefits ¹	Applicable to this Work Plan
Use renewable energy where possible or purchase Renewable Energy Credits	Reduce/supplement purchased energy use	
Use of remediation technologies with an intermittent energy supply (i.e., energy use during peak energy generation only)	Reduce energy use	X
Incorporate green building design	Reduce future use impacts	
Reuse existing buildings and infrastructure to reduce waste	Reduce waste and material use	
Reuse and recycle construction and demolition debris and other materials (i.e., grind waste wood and other organics for on-Site use)	Reduce waste and material use	
Design cover systems to be usable (i.e., habitat or recreation)	Reduce construction impacts of future development	
Reduce vehicle idling	Reduce air emissions and fuel use	X
Use of Low-Sulfur Diesel Fuel (LSDF) or alternate fuels (i.e., biodiesel or E85) when possible	Reduce air emissions	
Sequence work to minimize double handling of materials	Reduce construction impacts	X
Use energy-efficient systems and office equipment in the job trailer	Reduce energy use	X
¹ Potential benefits listed are not comprehensive and will vary depending upon the site and implementation of the practice or technique.		

In order to comply with the requirements of DER-31, the following actions will be taken:

1. All vehicles and fuel-consuming equipment on the Site will be shut off if not in use for more than three minutes;
2. Work will be sequenced, to the extent practicable, to allow the direct loading of waste containers for off-Site disposal;
3. Work will be sequenced, to the extent practicable, to limit unnecessary mobilizations to and throughout the Site; and
4. To the extent practicable, energy-efficient systems and office equipment will be utilized.

4.2 REPORTING

All green and sustainable practices and techniques employed will be discussed in the forthcoming RIR.

4.3 CLIMATE RESILIENCY EVALUATION

The Site is not located within a 100-year flood zone. The development plan is still under design but will incorporate consideration for resiliency to climate change, including the design of a cover system that will mimic, rather than alter, the current setting in the vicinity of the Site and will provide pathways for surface runoff and resiliency against future flooding events. A Climate Screening Checklist is provided in Appendix E.

4.4 ENVIRONMENTAL FOOTPRINT ANALYSIS

A preliminary environmental footprint analysis has been performed using Spreadsheets for the Environmental Footprint Analysis (SEFA) for the RI. The RI would potentially export up to approximately 60 tons of non-hazardous waste off the Site to a recycling facility. Additionally, the RI will potentially result in air emissions during drilling and off-Site disposal required. The RI will require the collection, transportation, and analysis of soil, groundwater, and soil vapor samples. Results of the preliminary analysis, available in Appendix F, indicate the majority of greenhouse gas emissions, potentially exceeding 1.25 metric tons, to be the product of consumables and transportation associated with the RI.

5. Quality Assurance and Quality Control

Quality Assurance/Quality Control (QA/QC) procedures will be used to provide performance information with regard to the accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used (1) to document that samples are representative of actual conditions at the Site and (2) to identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix or by laboratory techniques that may have introduced systematic or random errors to the analytical process.

QA/QC procedures are defined in the QAPP included in Appendix C.

6. Data Use

6.1 DATA SUBMITTAL

Analytical data will be supplied in ASP Category B Data Packages. If more stringent than those suggested by the USEPA, the laboratory's in-house QA/QC limits will be utilized. Validated data will be submitted to the NYSDEC EQulS database in an Electronic Data Deliverable (EDD) package.

6.2 DATA VALIDATION

Data packages will be sent to a qualified data validation specialist to evaluate the accuracy and precision of the analytical results. A Data Usability Summary Report (DUSR) will be created to confirm the compliance of methods with the protocols described in the NYSDEC ASP. DUSRs will summarize and confirm the usability of the data for project-related decisions. Data validation will be completed in accordance with the DUSR guidelines from the NYSDEC DER. DUSRs will be included with the submittal of an RIR, further discussed in Section 9. Additional details on the DUSRs are provided in the QAPP in Appendix C.

7. Project Organization

A project team for the Site has been created based on qualifications and experience with personnel suited for successfully completing the project.

The NYSDEC-designated Case Manager, Rebecca Kerrigan, will be responsible for overseeing the successful completion of the project work and adherence to the work plan on behalf of NYSDEC.

The NYSDOH-designated Case Manager, Jacob Tyler, will be responsible for overseeing the successful completion of the project work and adherence to the work plan on behalf of NYSDOH.

James M. Bellew will be the Principal in Charge for this work. In this role, Mr. Bellew will be responsible for the overall completion of each task as per the requirements outlined in this work plan and in accordance with the DER-10 guidance.

Emily Butler will be the Project Manager and Qualified Environmental Professional (QEP) for this work. In this role, Ms. Butler will manage the day-to-day tasks, including coordination and supervision of field engineers and scientists, adherence to the work plan, and oversight of the project schedule. As the Project Manager, Ms. Butler will also be responsible for communications with the NYSDEC Case Manager regarding project status, schedule, issues, and updates for project work.

Zachary P. Simmel will be the Assistant Project Manager for this work and will also function as the Quality Assurance Officer (QAO). The QAO will ensure the application and effectiveness of the QAPP by the analytical laboratory and the project staff, provide input to the field team as to corrective actions that may be required as a result of the above-mentioned evaluations, and prepare and/or review data validation and audit reports.

Charlotte Lorthioir will be the field geologist responsible for implementing the field effort for this work. Her responsibilities will include implementing the work plan activities and directing the subcontractors to ensure the successful completion of all field activities.

The drilling subcontractor will be Lakewood Environmental Services Corporation (Lakewood). Lakewood will provide a Geoprobe® operator to implement the scope of work in this RIWP.

The geophysical survey contractor will be Nova Geophysical Services, LLC (Nova). In this role, Nova will conduct a geophysical survey throughout all accessible regions of the Site prior to the performance of ground-intrusive work.

The analytical laboratory will be Alpha Analytical (Alpha) of Westborough, Massachusetts, a New York Environmental Laboratory Approval Program (ELAP)-certified laboratory (No. 11148). Alpha will be responsible for analyzing samples as per the analyses and methods identified in Section 3.

8. Health and Safety

8.1 HEALTH AND SAFETY PLAN

A Site-specific Health and Safety Plan (HASP) has been prepared in accordance with NYSDEC and NYSDOH guidelines and is provided as Appendix G of this work plan. The HASP includes a description of health and safety protocols to be followed by Haley & Aldrich of New York field staff during implementation of the remedy, including monitoring within the work area, along with response actions should impacts be observed. The HASP has been developed in accordance with the Occupational Safety and Health Administration (OSHA) 40 Code of Federal Regulations (CFR) Part 1910.120 regulatory requirements for use by Haley & Aldrich of New York field staff who will work at the Site during planned activities. Contractors or other personnel who perform work at the Site are required to develop their own HASP and procedures of comparable or higher content for their respective personnel in accordance with relevant OSHA regulatory requirements for work at hazardous waste sites, as well as the general industry, as applicable, based on the nature of work being performed.

8.2 COMMUNITY AIR MONITORING PLAN

The proposed investigation work will be completed outdoors at the Site. Where intrusive drilling operations are planned, community air monitoring will be implemented to protect downwind receptors. A Haley & Aldrich of New York representative will continually monitor the breathing air in the vicinity of the immediate work area using a PID to measure total VOCs in the air at concentrations as low as 1 ppm. The air in the work zone will also be monitored for visible dust generation.

If VOC measurements above 5 ppm are sustained for 15 minutes or visible dust generation is observed, the intrusive work will be temporarily halted, and a more rigorous monitoring of VOCs and dust using recordable meters will be implemented in accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP). CAMP data will be provided to NYSDEC in the daily reports, further detailed in Section 9. The NYSDOH CAMP guidance document is included as Appendix H.

8.3 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

A comprehensive Qualitative Human Health Exposure Assessment (QHHEA) will be performed following the collection of all RI data. The exposure assessment (EA) will be performed in accordance with Section 3.3(c)4 of DER-10 and the NYSDOH guidance for performing a qualitative EA (DER-10; Appendix 3B). The results of the QHHEA will be provided in the RIR. Based on the requirements stipulated in Section 3.10 and the decision key in Appendix 3C of DER-10, there was no need to prepare a Fish and Wildlife Resource Impact Analysis for the Site. This is due to the fact that the Site is not related to a spill or discharge event (Item 1 of the Decision Key), and while the Site is a point source of contamination to the groundwater with soil contamination confined under historical building foundations (Item 2 of the Decision Key), the Site does not have the potential to migrate to, erode into, or otherwise impact any on-Site or off-Site habitat of endangered, threatened, or special concern species or other fish and wildlife resource (Item 13 of the Decision Key). The land area of the Site provides poor conditions for the wildlife population due to a lack of food sources and cover. Urban-

adapted species such as raccoons and rats use the Site infrequently. Therefore, as per Item 14 of the Decision Key, no Fish and Wildlife Resource Impact Analysis is required at this time.

9. Reporting

Daily reports will be submitted to NYSDEC and NYSDOH summarizing the Site activities completed during the RI. Daily reports will include a Site figure, a description of Site activities, a photo log, and CAMP data. Daily reports will be submitted on the following calendar day after Site work is completed.

Following the completion of the work, a summary of the RI will be provided to NYSDEC in an RIR to support the implementation of the proposed remedial action. The report will include:

- Summary of the RI activities;
- Figure showing sampling locations;
- Tables summarizing laboratory analytical results;
- Laboratory analytical data reports;
- Field sampling data sheets;
- Community air monitoring data;
- Findings regarding the nature and extent of contamination at the Site;
- Qualitative exposure assessment of any contamination from an on-Site source that has migrated off the Site; and
- Conclusions and recommendations.

The RIR may be combined with the Remedial Action Work Plan (RAWP) as an RIR/RAWP. The RIR/RAWP will include all data collected during the RI and adhere to the technical requirements of DER-10.

10. Schedule

The Site owner, as Volunteer, plans to implement this RIWP promptly upon execution of a Brownfield Cleanup Agreement (BCA) and after approval of the RIWP. The below anticipated schedule highlights BCP milestones anticipated for the Site.

Anticipated RI Schedule	
BCP Application, Permitting, RIWP, and 30-Day Public Comment Period (Concurrent with BCP Application)	June 2025 to September 2026
Executed BCA	October 2025
NYSDEC Approval of RIWP	January 2026
RI Implementation	January 2026 to February 2026
RIR and RAWP Submittal and 45-Day Public Comment Period	February 2026 to March 2026
NYSDEC Approval of RIR and RAWP	July 2026

References

1. Astoria Cove Additional Subsurface Sampling, prepared by GEI Consultants, Inc., P.C., June 2020.
2. DER-31/Green Remediation DEC Program Policy, New State Department of Environmental Conservation, January 2011.
3. “Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York,” New York State Department of Health, October 2006.
4. Geotechnical Report, prepared by GEI Consultants, Inc., P.C., December 2023.
5. “Green Remediation Best Management Practices: Site Investigation and Environmental Monitoring,” United States Environmental Protection Agency, September 2016.
6. “Guidelines on Installation of Overburden Wells (Monitoring Wells) for Environmental Investigations,” undated.
7. Phase I Environmental Site Assessment, prepared by Haley & Aldrich of New York, March 2025.
8. Program Policy DER-10, “Technical Guidance for Site Investigation and Remediation,” New York State Department of Environmental Conservation, May 2010.
9. Remedial Investigation Report, prepared by GEI Consultants, Inc., P.C., April 2022.

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TABLE

TABLE 1
SAMPLING AND ANALYSIS PLAN
FORMER TILSDALE LUMBER AND COAL REDEVELOPMENT SITE
QUEENS, NEW YORK

Boring Number	Sample Depth	Target Compound List VOCs (8260D)	Target Compound List SVOCs (8270E)	Total Analyte List Metals (6020B)	PCBs (8082A)	Pesticides (8081B)	PFAS (1633A)	1,4-Dioxane (8270E SIM)	Dissolved Target Analyte Metals (6020B)	VOCs (TO-15)	Total and TCLP Lead (6010B)
SOIL											
RI-SB-01	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-02	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-03	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-04	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-05	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-06	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-07	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-08	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-09	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-10	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-

TABLE 1
SAMPLING AND ANALYSIS PLAN
FORMER TILSDALE LUMBER AND COAL REDEVELOPMENT SITE
QUEENS, NEW YORK

Boring Number	Sample Depth	Target Compound List VOCs (8260D)	Target Compound List SVOCs (8270E)	Total Analyte List Metals (6020B)	PCBs (8082A)	Pesticides (8081B)	PFAS (1633A)	1,4-Dioxane (8270E SIM)	Dissolved Target Analyte Metals (6020B)	VOCs (TO-15)	Total and TCLP Lead (6010B)
RI-SB-11	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-12	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-13	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-14	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-15	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-16	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-17	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-18	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-19	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
RI-SB-20	0-2'	X	X	X	X	X	X	X		-	-
	Intermediate depth of fill layer	X	X	X	X	X	X	X		-	-
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X		-	-
SB-106_D	3-5'	-	-	-	-	-	-	-		-	X
B-15_D	0-2'	X	X	X	X	X	X	X		-	X
	Intermediate depth of fill layer	X	X	X	X	X	X	X			
	Development depth or 2 ft interval above water table	X	X	X	X	X	X	X			
B-21_D	0-2'	-	-	-	-	-	-	-		-	X

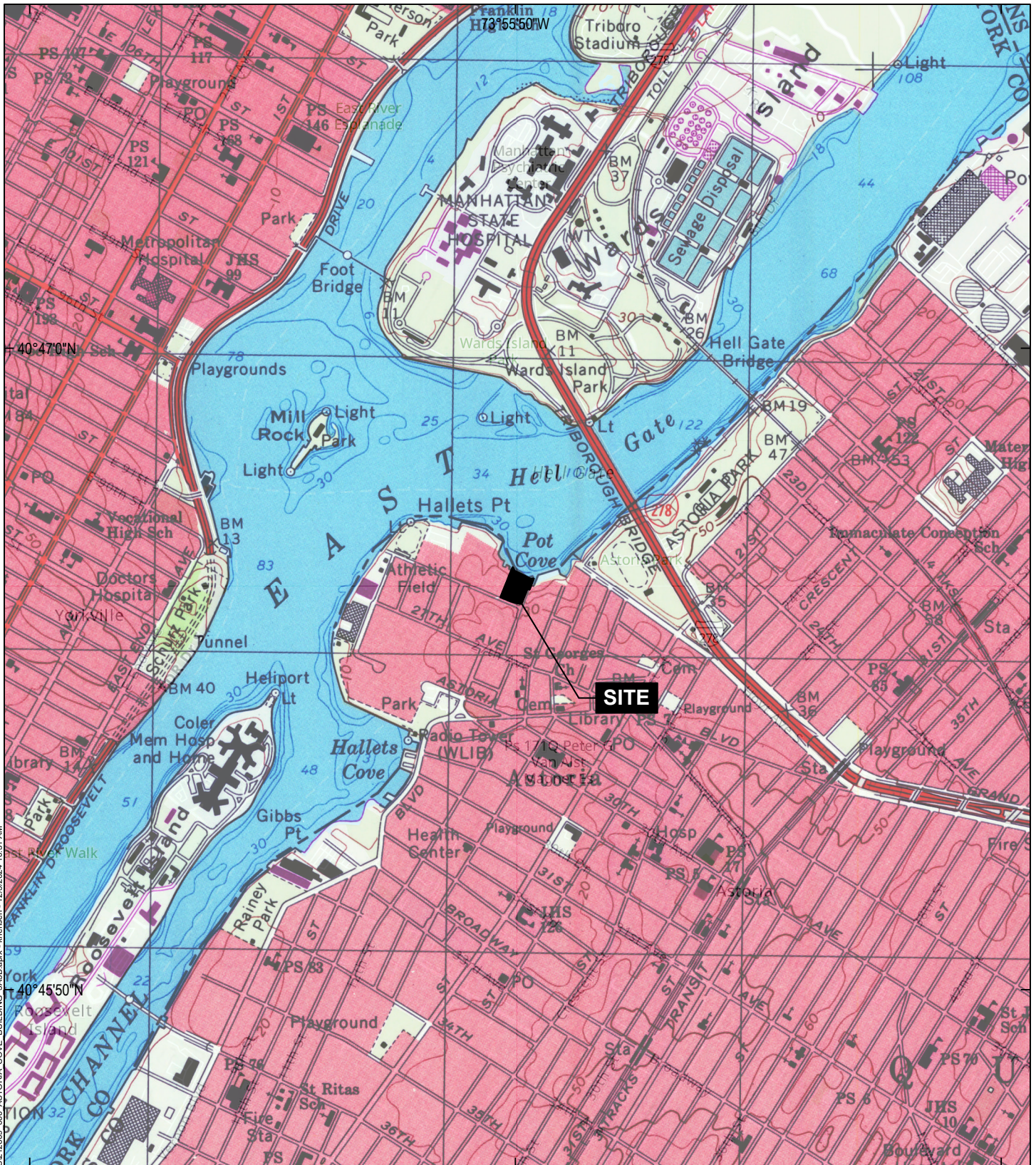
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QUEENS, NEW YORK

Boring Number	Sample Depth	Target Compound List VOCs (8260D)	Target Compound List SVOCs (8270E)	Total Analyte List Metals (6020B)	PCBs (8082A)	Pesticides (8081B)	PFAS (1633A)	1,4-Dioxane (8270E SIM)	Dissolved Target Analyte Metals (6020B)	VOCs (TO-15)	Total and TCLP Lead (6010B)
GROUNDWATER											
RI-MW-01	-	X	X	X	X	X	X	X	X	-	-
RI-MW-02	-	X	X	X	X	X	X	X	X	-	-
RI-MW-03	-	X	X	X	X	X	X	X	X	-	-
RI-MW-04	-	X	X	X	X	X	X	X	X	-	-
RI-MW-05	-	X	X	X	X	X	X	X	X	-	-
RI-MW-06	-	X	X	X	X	X	X	X	X	-	-
RI-MW-07	-	X	X	X	X	X	X	X	X	-	-
RI-MW-08	-	X	X	X	X	X	X	X	X	-	-
RI-MW-09	-	X	X	X	X	X	X	X	X	-	-
RI-MW-10	-	X	X	X	X	X	X	X	X	-	-
RI-MW-11	-	X	X	X	X	X	X	X	X	-	-
SOIL VAPOR											
RI-SV-01	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-02	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-03	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-04	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-05	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-06	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-07	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-08	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-09	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-10	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-
RI-SV-11	Development depth or 2 ft interval above water table	-	-	-	-	-	-	-		X	-

Notes:
VOCs - Volatile Organic Compounds
SVOCs - Semi-volatile Organic Compounds
PCBs - Polychlorinated Biphenyls
PFAS - Per- and Polyfluoroalkyl Substances
X = Run for analysis
Groundwater to be sampled for total and dissolved metals

QAQC samples include:
MS/MSD - 1 for every 20 samples
Field Duplicate - 1 for every 20 samples
Trip Blanks - 1 per cooler of samples to be analyzed for VOCs
Field Blanks - 1 for every 20 samples
"- " = Not applicable

FIGURES



GIS: \\haleyaldrich.com\share\CF\Projects\0211417\GIS\212609_000 ASTORIA COVE BUILDING 3A3B.aprx - khensen - 12/3/2024 10:31 AM



MAP SOURCE: USGS
SITE COORDINATES: 40°46'34"N, 73°55'50"W

**HALEY
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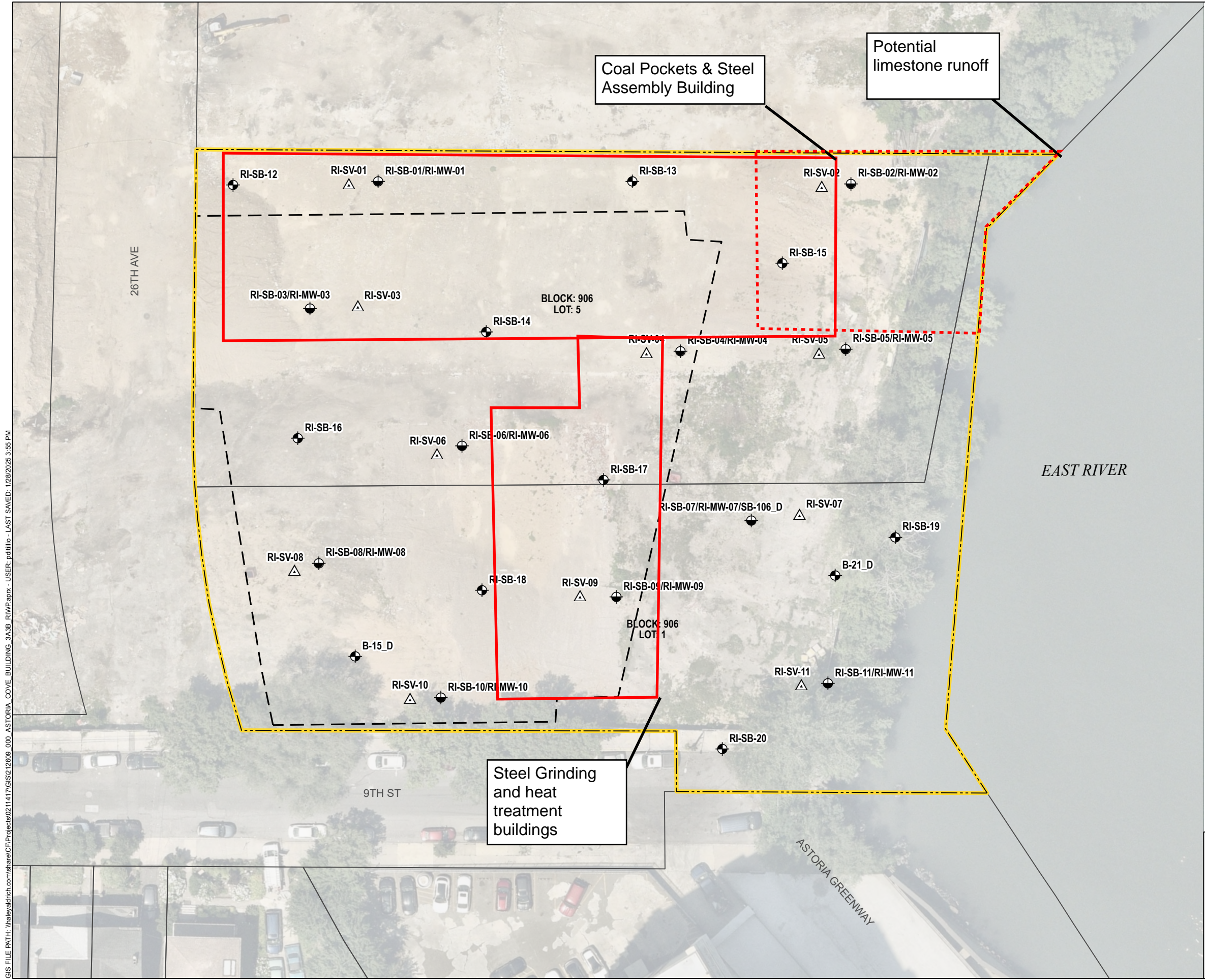
8-01 AND 8-51 26TH AVENUE
QUEENS, NEW YORK

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
DECEMBER 2024

FIGURE 1

GIS FILE PATH: \\haleyaldrich.com\share\CF\Projects\0211417\GIS\12609_000 ASTORIA COVE BUILDING 3A3B RIWP.aprx - USER: pdillio - LAST SAVED: 1/28/2025 3:55 PM

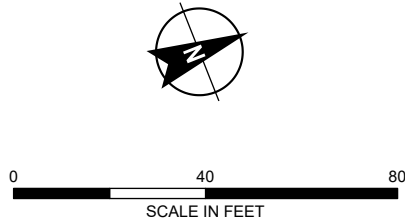


LEGEND

- PROPOSED SOIL BORING
- PROPOSED SOIL BORING/MONITORING WELL
- PROPOSED SOIL VAPOR SAMPLE
- PROPOSED BUILDING FOOTPRINT
- SITE BOUNDARY
- PARCEL BOUNDARY
- AREAS OF CONCERN

NOTES

- ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
- ASSESSOR PARCEL DATA SOURCE: NEW YORK CITY DEPARTMENT OF CITY PLANNING (DCP)
- AERIAL IMAGERY SOURCE: NEARMAP, 18 JUNE 2024



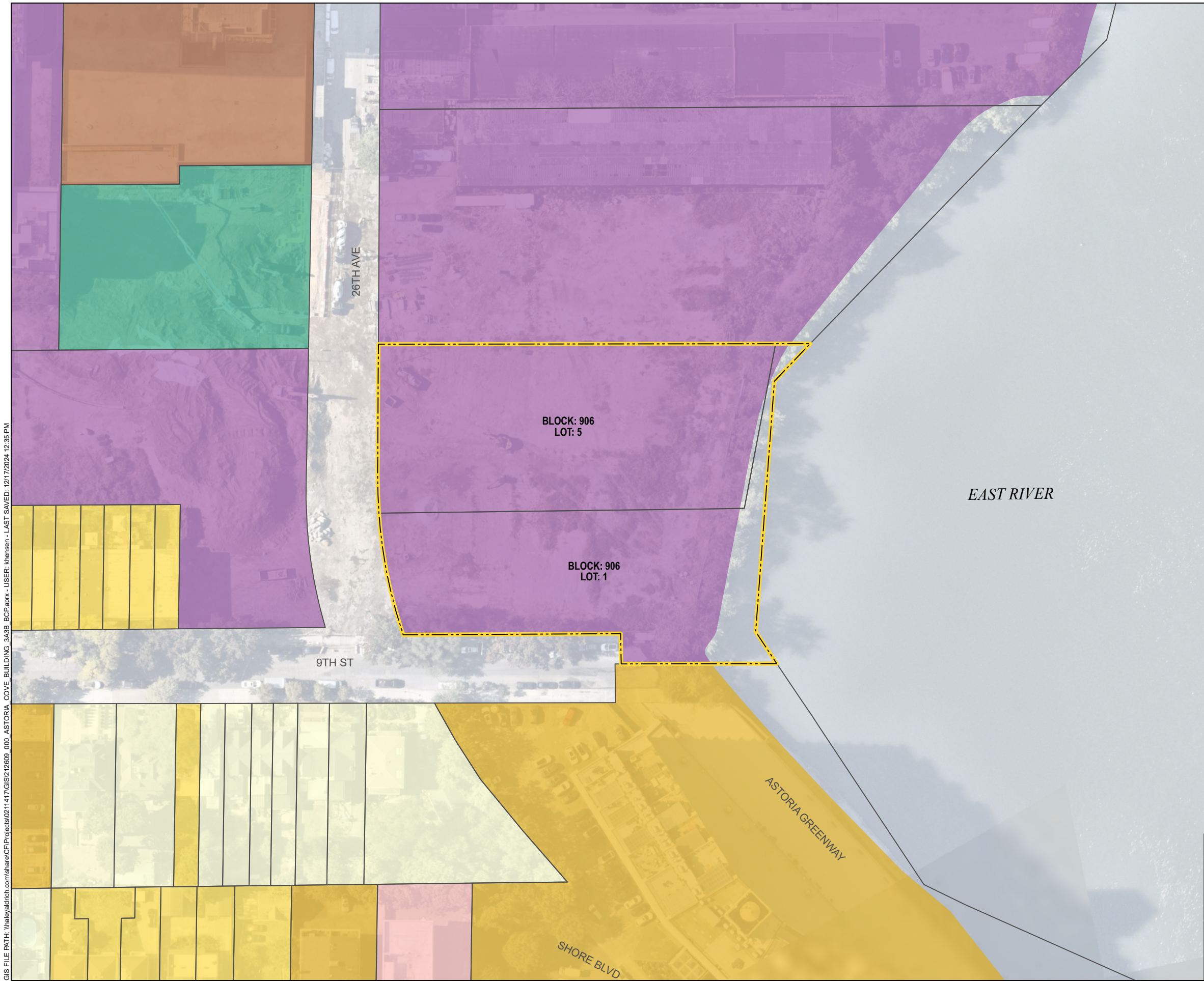
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8-01 AND 8-51 26TH AVENUE
QUEENS, NEW YORK

PROPOSED SAMPLE LOCATION MAP

DECEMBER 2025

FIGURE 2



LEGEND

LAND USE CATEGORY

- ONE AND TWO FAMILY BUILDINGS
- MULTI-FAMILY WALK-UP BUILDINGS
- MULTI-FAMILY ELEVATOR BUILDINGS
- MIXED RESIDENTIAL AND COMMERCIAL BUILDINGS
- INDUSTRIAL AND MANUFACTURING BUILDINGS
- VACANT LAND
- NOT CATEGORIZED
- SITE BOUNDARY
- TAX LOT BOUNDARY

NOTES

- ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
- ASSESSOR PARCEL DATA SOURCE: NYC DEPARTMENT OF CITY PLANNING, INFORMATION TECHNOLOGY DIVISION
- LAND USE DATA SOURCE: NYC DEPARTMENT OF CITY PLANNING
- AERIAL IMAGERY SOURCE: NEARMAP, 11 OCTOBER 2024



0 80 160
SCALE IN FEET

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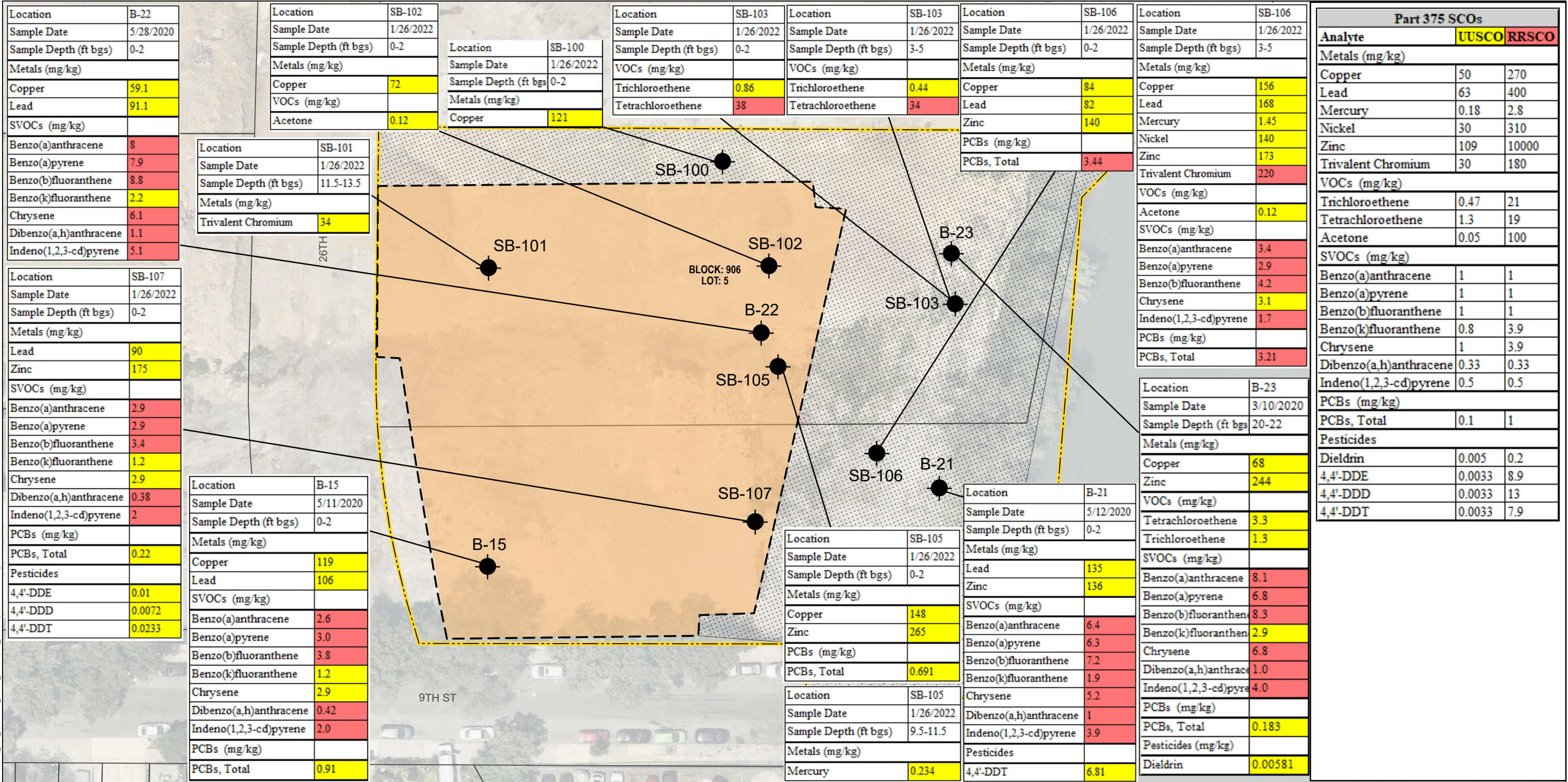
8-01 AND 8-51 26TH AVENUE
QUEENS, NEW YORK

SURROUNDING LAND USE

DECEMBER 2024

FIGURE 3

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LEGEND

- PROPOSED BUILDING FOOTPRINT
- EXCAVATION DEPTHS IN FEET BELOW GRADE
- LIMITED TO GRADING AS NEEDED
- 4.5 TO 12.5 FEET

- SITE BOUNDARY
- PARCEL BOUNDARY
- SOIL SAMPLE

NOTES

- ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
- ASSESSOR PARCEL DATA SOURCE: NEW YORK CITY DEPARTMENT OF CITY PLANNING (DCP)
- AERIAL IMAGERY SOURCE: NEARMAP, 18 JUNE 2024



0 45 90
SCALE IN FEET

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8-01 AND 8-51 26TH AVENUE
ASTORIA, NEW YORK

SOIL EXCEEDANCE MAP

JANUARY 2025

FIGURE 4

GIS FILE PATH: \\haleyaldrich.com\share\CF\Projects\0211417\GIS\0211417_000_ASTORIA_COVE_BUILDING_3A3B.aprx - USER: rmljones - LAST SAVED: 7/17/2024 10:03 PM

Location	MW-1
Sample Date	2/1/2022
SVOCs (ug/L)	
Benzo(b)fluoranthene	0.01
Metals (ug/L)	
Magnesium (Dissolved)	36,300
Sodium (Dissolved)	80,500
Iron, Total	4,700
Magnesium, Total	38,800
Sodium, Total	77,800

Location	MW-2
Sample Date	2/2/2022
VOCs (ug/L)	
Tetrachloroethene	11
SVOCs (ug/L)	
Phenol	3.9
Benzo(a)anthracene	0.54
Benzo(a)pyrene	0.56
Benzo(b)fluoranthene	0.77
Benzo(k)fluoranthene	0.2
Chrysene	0.45
Indeno(1,2,3-cd)pyrene	0.47
PCBs	
PCBs, Total	2.29
Metals (ug/L)	
Magnesium (Dissolved)	494,000
Sodium (Dissolved)	4,410,000
Iron, Total	10,800
Lead, Total	100.3
Magnesium, Total	571,000
Sodium, Total	4,200,000
PFAS (ug/L)	
Perfluorooctanoic Acid (PFOA)	0.0287
Perfluorooctanesulfonic Acid (PFOS)	0.0380

Analyte	AWQS
VOCs (ug/L)	
Tetrachloroethene	5
Trichloroethene	5
SVOCs (ug/L)	
Phenol	1
Benzo(a)Anthracene	0.002
Benzo(a)Pyrene	0.00
Benzo(b)Fluoranthene	0.002
Benzo(k)Fluoranthene	0.002
Chrysene	0.002
Indeno(1,2,3-c,d)Pyrene	0.002
Polychlorinated Biphenyls (ug/L)	
Total PCBs	0.09
Metals (ug/L)	
Iron	300
Lead	25
Magnesium	35000
Manganese	300
Sodium	20000
PFAS (ug/L)	
NYSDEC GV	
Perfluorooctanoic Acid (PFOA)	0.01
Perfluorooctanesulfonic Acid (PFOS)	0.01

Location	MW-4
Sample Date	2/1/2022
Metals (ug/L)	
Magnesium (Dissolved)	41,700
Manganese (Dissolved)	1,124
Sodium (Dissolved)	112,000
Iron, Total	3,910
Magnesium, Total	48,600
Manganese, Total	1,251
Sodium, Total	115,000
PFAS (ug/L)	
Perfluorooctanoic Acid (PFOA)	0.0409
Perfluorooctanesulfonic Acid (PFOS)	0.0271

Location	MW-3
Sample Date	2/2/2022
VOCs (ug/L)	
Trichloroethene	13
SVOCs (ug/L)	
Phenol	1.1
Benzo(a)anthracene	0.09
Benzo(a)pyrene	0.08
Benzo(b)fluoranthene	0.12
Benzo(k)fluoranthene	0.03
Chrysene	0.09
Indeno(1,2,3-cd)pyrene	0.06
Metals (ug/L)	
Magnesium (Dissolved)	288,000
Sodium (Dissolved)	2,580,000
Iron, Total	3,300
Lead, Total	158.1
Magnesium, Total	356,000
Sodium, Total	2,420,000

Location	DUP01
Sample Date	2/2/2022
VOCs (ug/L)	
Trichloroethene	13
SVOCs (ug/L)	
Phenol	3.7
Benzo(a)anthracene	0.04
Benzo(a)pyrene	0.03
Benzo(b)fluoranthene	0.04
Benzo(k)fluoranthene	0.01
Chrysene	0.03
Indeno(1,2,3-cd)pyrene	0.02
Metals (ug/L)	
Magnesium (Dissolved)	330,000
Sodium (Dissolved)	2,950,000
Iron, Total	1,740
Lead, Total	72.13
Magnesium, Total	315,000
Sodium, Total	2,530,000

LEGEND

- PROPOSED BUILDING FOOTPRINT
- EXCAVATION DEPTHS IN FEET BELOW GRADE
- LIMITED TO GRADING AS NEEDED
- 4.5 TO 12.5 FEET

- SITE BOUNDARY
- PARCEL BOUNDARY
- GROUND WATER SAMPLE

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: NEW YORK CITY DEPARTMENT OF CITY PLANNING (DCP)
3. AERIAL IMAGERY SOURCE: NEARMAP, 18 JUNE 2024



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8-01 AND 8-51 26TH AVENUE
ASTORIA, NEW YORK

GROUNDWATER
EXCEEDANCE MAP

JANUARY 2025

FIGURE 5

GIS FILE PATH: \\haleyaldrich.com\share\CF\Projects\0211417\GIS\0211417_000_ASTORIA_COVE_BUILDING_3A3B.aprx - USER: rmljones - LAST SAVED: 7/17/2024 10:03 PM

Location	SV-2
Sample Date	2/02/2022
VOCs $\mu\text{g}/\text{m}^3$	
n-Hexane	1.46
1,1,1-Trichloroethane	7.15
Benzene	1.36
Cyclohexane	0.76
2,2,4-Trimethylpentane	1.03
Heptane	0.979
Toluene	2.69

Location	SV-6
Sample Date	2/02/2022
VOCs $\mu\text{g}/\text{m}^3$	
n-Hexane	2.48

Location	SV-3
Sample Date	2/02/2022
VOCs $\mu\text{g}/\text{m}^3$	
1,1-Dichloroethene	32.9
n-Hexane	2.07
1,1,1-Trichloroethane	606.00
Benzene	1.19
Cyclohexane	0.781
Heptane	3.38
Toluene	8.86

Location	SV-4
Sample Date	2/02/2022
VOCs $\mu\text{g}/\text{m}^3$	
Benzene	0.799
Methylene Chloride	2.480
Toluene	1.65

Location	SV-5
Sample Date	2/02/2022
VOCs $\mu\text{g}/\text{m}^3$	
cis-1,2-Dichloroethene	16.9
n-Hexane	10.8
1,1,1-Trichloroethane	316
Benzene	5.62
Cyclohexane	5.20
Trichloroethene	23.2
Toluene	6.52

LEGEND

- PROPOSED BUILDING FOOTPRINT
- EXCAVATION DEPTHS IN FEET BELOW GRADE
- LIMITED TO GRADING AS NEEDED
- 4.5 TO 12.5 FEET

- SITE BOUNDARY
- PARCEL BOUNDARY
- SOIL VAPOR SAMPLE

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: NEW YORK CITY DEPARTMENT OF CITY PLANNING (DCP)
3. AERIAL IMAGERY SOURCE: NEARMAP, 18 JUNE 2024



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8-01 AND 8-51 26TH AVENUE
ASTORIA, NEW YORK

SOIL VAPOR CHEMISTRY MAP

JANUARY 2025

FIGURE 6

APPENDIX A
Previous Reports (Provided as Separate Files)

APPENDIX B

Field Sampling Plan

FIELD SAMPLING PLAN
FORMER TILSDALE LUMBER AND COAL REDEVELOPMENT SITE
8-01 AND 8-51 26TH AVENUE
QUEENS, NEW YORK

by
H & A of New York Engineering and Geology, LLP
New York, New York

for
KS Astoria LLC
Newark, New Jersey

File No. 0211417-001
December 2025



Table of Contents

	Page
List of Appendices	iii
1. Introduction	1
2. Field Program	2
3. Utility Clearance	3
4. Field Data Recording	6
4.1 WRITTEN FIELD DATA	6
4.2 ELECTRONIC DATA	7
5. Aquifer Characterization	9
5.1 PROCEDURE	9
6. Sample Collection for Laboratory Analysis	10
6.1 SOIL SAMPLE COLLECTION FOR LABORATORY ANALYSIS	10
6.1.1 Preparatory Requirements	10
6.1.2 Soil Classification	10
6.1.3 Soil Sampling	11
6.1.4 Sampling Techniques	12
6.2 GROUNDWATER SAMPLE COLLECTION FOR LABORATORY ANALYSIS	12
6.2.1 Preparatory Requirements	13
6.2.2 Well Development	13
6.2.3 Well Purging and Stabilization Monitoring (Low-Stress/Low-Flow Method)	14
6.2.4 Sampling Techniques	15
6.3 SUB-SLAB/SOIL VAPOR SAMPLING	17
6.3.1 Preparatory Requirements	17
6.3.2 Sampling Techniques	17
6.4 SAMPLE HANDLING AND SHIPPING	18
6.4.1 Sample Handling	18
6.4.2 Sample Labeling	18
6.4.3 Field Code	19
6.4.4 Packaging	19
6.4.5 Chain-of-Custody Records	20
6.4.6 Shipment	21
7. Field Instruments – Use and Calibration	22
7.1 GENERAL PROCEDURE DISCUSSION	22
7.2 DECONTAMINATION OF MONITORING EQUIPMENT	23

Table of Contents

	Page
7.3 DISPOSAL OF WASH SOLUTIONS AND CONTAMINATED EQUIPMENT	23
8. Investigation-Derived Waste Disposal	24
8.1 RATIONALE/ASSUMPTIONS	24
8.2 PROCEDURE	24
References	25

List of Appendices

Appendix	Title
A	Field Forms

1. Introduction

This Field Sampling Plan (FSP) has been prepared as a component of the Remedial Investigation Work Plan (RIWP) for the Former Tilsdale Lumber and Coal Redevelopment Site located at 8-01 and 8-51 26th Avenue, Queens, New York (the “Site”). This document was prepared to establish field procedures for field data collection to be performed in support of the RIWP for the Site.

The RIWP includes this FSP, a Quality Assurance Project Plan (QAPP), a Health and Safety Plan (HASP), and a Community Air Monitoring Plan (CAMP), which are included as part of this plan by reference.

The standard operating procedures (SOPs) included as components of this plan will provide the procedures necessary to meet the project objectives. The SOPs will be used as reference for the methods to be employed for field sample collection and handling and the management of field data collected in the execution of the approved RIWP. The SOPs include numerous methods to execute the tasks of the RIWP. The Project Manager will select the appropriate method as required by field conditions and/or the objective of the respective project task at the time of sample collection. Field procedures will be conducted in general accordance with the New York State Department of Conservation (NYSDEC) Technical Guidance for Site Investigation and Remediation (Division of Environmental Remediation [DER]-10) and the Sampling, Analysis and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC Part 375 Remedial Program when applicable.

2. Field Program

This FSP provides the general purpose of sampling as well as procedural information. The RIWP contains the details on sampling and analysis (locations, depths, frequency, analyte lists, etc.).

The field program has been designed to acquire the necessary data to comply with the RIWP, and includes the following tasks:

- Soil sampling;
- Groundwater sampling;
- Soil vapor sampling; and
- Sampling of investigation-derived waste (IDW) as needed for disposal.

Previous investigations conducted at the Site identified the presence of contaminated soil/fill with exceedances of heavy metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), chlorinated volatile organic compounds (CVOCs), specifically tetrachloroethene (PCE), pesticides, and polychlorinated biphenyls (PCBs). Emerging contaminants (PFOA, PFOS, PFUnA) were identified in soil at the Site. Previous investigations conducted at the Site identified the presence of contaminated groundwater with exceedances of VOCs, SVOCs, PCBs, and dissolved metals. Emerging contaminants (PFBA, PFPeA, PFBS, PFHxA, PFHpA, PFHxS, PFOA, PFHpS, PFNA, PFOS, PFTA, and 1,4-dioxane) were identified in groundwater at the Site. VOCs, CVOCs, and acetone were identified in sub-slab vapor at the Site.

Previous investigations did not comprehensively delineate the extent of soil, groundwater, and soil vapor contamination at the Site. A Remedial Investigation (RI) will be performed upon acceptance of the Site into the Brownfield Cleanup Program (BCP) and approval of the RIWP, which will include additional targeted soil, groundwater, and soil vapor sampling. Results of the additional sample analyses will be used to confirm the results of the previous Site characterization activities, potentially identify an on-site source, and determine a course for remedial action.

The SOPs presented herein may be changed as required, dependent on Site conditions or equipment limitations at the time of sample collection. If the procedures employed differ from the SOP, the deviations will be documented in the associated sampling report.

3. Utility Clearance

Invasive remedial activities, such as excavation or remedial construction activities, require the location of underground utilities prior to initiating work. Such clearance is sound practice in that it minimizes the potential for damage to underground facilities and, more importantly, is protective of the health and safety of personnel. Under no circumstances will invasive activities be allowed to proceed without obtaining proper utility clearance by the appropriate public agencies and/or private entities. This clearance requirement applies to all work on both public and private properties, whether located in a dense urban area or a seemingly out-of-the-way rural location.

The drilling contractor performing the work will be responsible for obtaining utility clearance.

Utility clearance is required by law, and obtaining clearance includes contacting a public or private central clearance agency via a “one-call” telephone service and providing the proposed exploration location information. It is important to note that public utility agencies may not, and usually do not, have information regarding utility locations on private property.

Before beginning subsurface work at any proposed exploration locations, it is critical that all readily available information on underground utilities and structures be obtained. This includes publicly available information as well as information in the possession of private landowners. Any drawings obtained must be reviewed in detail for information pertaining to underground utilities.

Using the information obtained, the Site should be viewed in detail for physical evidence of buried lines or structures, including pavement cuts and patches, variation in or lack of vegetation, variations in grading, etc. Care must also be taken to avoid overhead utilities as well. Presence of surface elements of buried utilities should be documented, such as manholes, gas or water service valves, catch basins, monuments, or other evidence.

Overhead utility lines must be considered when choosing exploration and excavation locations. Most states require a minimum of 10 feet (ft) of clearance between equipment and energized wires. Such separation requirements may also be voltage-based and may vary depending on state or municipality regulations. In evaluating clearance from overhead lines, the same restrictions may apply to “drops,” or wires on a utility pole connecting overhead and underground lines.

Using the information obtained and observations made, proposed exploration or construction locations should be marked in the field. Marking locations can be accomplished using spray paint on the ground, stakes, or other means. All markings of proposed locations should be made in white, in accordance with the generally accepted universal color code for facilities identification (American Public Works Association [APWA] 4/99):

- White: Proposed Excavation or Drilling Location
- Pink: Temporary Survey Markings
- Red: Electrical Power Lines, Cables, Conduit, and Lighting Cables
- Yellow: Gas, Oil, Steam, Petroleum, or Gaseous Materials
- Orange: Communication, Alarm or Signal Lines, Cables or Conduits
- Blue: Potable Water

- Purple: Reclaimed Water, Irrigation and Slurry Lines
- Green: Sewers and Drain Lines

To effectively evaluate the proposed locations with these entities, detailed, accurate measurements between the proposed locations and existing surface features should be obtained. Such features can be buildings, street intersections, utility poles, guardrails, etc.

Obtaining utility clearance generally involves the designated “one-call” underground facilities protection organization for the area and the landowner, and one or both of the following:

- A third-party utility locator company will be utilized to locate underground utilities outside of the public right-of-way; and/or
- “Soft dig” excavation techniques to confirm or deny the presence of underground utilities in the area.

The proposed locations should be evaluated in light of the information available for existing underground facilities. The detailed measurement information described above will be required by the “one-call” agency. The owners of the applicable, participating underground utilities are obligated to mark their respective facilities at the Site in the colors described above. Utility stake-out activities will typically not commence for approximately 72 hours after the initial request is made.

The public and private utility entities generally only mark the locations of their respective underground facilities within public rights-of-way. Determination of the locations of these facilities on private property will be the responsibility of the property owner or Contractor. If available information does not contain sufficient detail to locate underground facilities with a reasonable amount of confidence, alternate measures may be appropriate, as described below. In some cases, the memory of a long-time employee of a facility on private property may be the best or only source of information. It is incumbent on the Consultant or Contractor to exercise caution and use good judgement when faced with uncertainty.

Note: It is important to note that not all utilities are participants in the “one-call” agency or process. As such, inquiries must be made with the “one-call” agency to determine which entities do not participate, so they can be contacted independently.

Most utility stakeouts have a limited time period for which they remain valid, typically two to three weeks. It is critical that this time period be considered to prevent expiration of clearance prior to completion of the invasive activities and the need to repeat the stake-out process.

Care must be exercised to document receipt of notice from the involved agencies of the presence or absence of utilities in the vicinity of the proposed locations.

Most agencies will generally provide a telephone or fax communication indicating the lack of facilities in the project area. If contact is not made by all of the agencies identified by the “one-call” process, do not assume that such utilities are not present. Re-contact the “one-call” agency to determine the status.

For complicated sites with multiple proposed locations and multiple utilities, it is advisable to arrange an on-site meeting with utility representatives. This will minimize the potential for miscommunication amongst the involved parties.

Completion of the utility stake out process is not a guarantee that underground facilities will not be encountered in excavations or boreholes; in fact, most “one-call” agencies and individual utilities do not offer guarantees, nor do they accept liability for damage that might occur. In areas outside the public right-of-way, a utility locating service may be utilized to locate underground utilities. It is advisable that any invasive activities proceed with extreme caution in the upper 4 to 5 ft in the event the clearance has failed to identify an existing facility. This may necessitate hand-excavation or probing to confirm the potential presence of shallow utilities. If uncertainty exists for any given utility, extra activities can be initiated to solve utility clearance concerns. These options include:

- Screening the proposed work areas with utility locating devices, and/or hiring a utility locating service to perform this task.
- Hand digging, augering, or probing to expose or reveal shallow utilities and confirm presence and location. In northern climates, this may require advancing to below the frost line, typically at least 4 ft.
- Using “soft dig” techniques that utilize specialized tools and compressed air to excavate soils and locate utilities. This technique is effective in locating utilities to a depth of 4 to 5 ft.

Equipment/Materials:

- White Spray paint
- Wooden stakes, painted white or containing white flagging
- Color-code key
- Available drawings

4. Field Data Recording

This procedure describes the protocol for documenting the investigation activities in the field. Field data serves as the cornerstone for an environmental project, not only for site characterization but for additional phases of investigation or remedial design. Producing defensible data includes proper and appropriate recording of field data as it is obtained in a manner to preserve the information for future use. This procedure provides guidelines for accurate, thorough collection and preservation of written and electronic field data.

Field data to be recorded during the project generally includes, but is not limited to, the following:

- general field observations;
- numeric field measurements and instrument readings;
- quantity estimates;
- sample locations and corresponding sample numbers;
- relevant comments and details pertaining to the samples collected;
- documentation of activities, procedures, and progress achieved;
- contractor pay item quantities;
- weather conditions;
- a listing of personnel involved in Site-related activities;
- a log of conversations, Site meetings, and other communications; and,
- field decisions and pertinent information associated with the decisions.

4.1 WRITTEN FIELD DATA

Written field data will be collected using a standardized, pre-printed field log form. In general, the use of a field log form is preferable as it prompts field personnel to make appropriate observations and record data in a standardized format. This promotes completeness and consistency from one person to the next. Otherwise, electronic data collection using a handheld device produces equal completeness and consistency using a preformatted log form.

In the absence of an appropriate pre-printed form, the data should be recorded in an organized and structured manner in a dedicated project field log book. Log books must be hardcover, bound so that pages cannot be added or removed, and should be made from high-grade 50 percent rag paper with a water-resistant surface.

The following are guidelines for use of field log forms and log books:

1. Information must be factual and complete.
2. All entries will be made in black indelible ink with a ballpoint pen and will be written legibly. Do not use “rollerball” or felt tip-style pens, since the water-soluble ink can run or smear in the presence of moisture.
3. Field log forms should be consecutively numbered.

4. Each day's work must start on a new form/page.
5. At the end of each day, the current log book page or forms must be signed and dated by the field personnel making the entries.
6. Make data entries immediately upon obtaining the data. Do not make temporary notes in other locations for later transfer; this only increases the potential for error or loss of data.
7. Entry errors are to be crossed out with a single line and initialed by the person making the correction.
8. Do not leave blanks on log forms; if no entry is applicable for a given data field, indicate so with "NA" or a dash ("--").
9. At the earliest practical time, photocopies or typed versions of log forms and log book pages should be made and placed in the project file as a backup in the event the book or forms are lost or damaged.
10. Log books should be dedicated to one project only, i.e., do not record data from multiple projects in one log book.

4.2 ELECTRONIC DATA

Electronic data recording involves electronic measurement of field information through the use of monitoring instruments, sensors, gauges, and equipment controls. The following is a list of guidelines for proper recording and management of electronic field data:

1. Field data management should follow the requirements of a project-specific data management plan (DMP), if applicable.
2. Use only instruments that have been calibrated in accordance with manufacturer's recommendations.
3. Usage of instruments, controls, and computers for the purpose of obtaining field data should only be performed by personnel properly trained and experienced in the use of the equipment and software.
4. Use only fully-licensed software on personal computers and laptops.
5. Loss of electronic files may mean loss of irreplaceable data. Every effort should be made to back up electronic files obtained in the field as soon as practical. A backup file placed on the file server will minimize the potential for loss.
6. Electronic files, once transferred from field instruments or laptops to office computers, should be protected, if possible, to prevent unwanted or inadvertent manipulation or modification of data. Several levels of protection are usually available for spreadsheets, including making a file "read-only" or assigning a password to access the file.
7. Protect CDs from exposure to moisture, excessive heat or cold, magnetic fields, or other potentially damaging conditions.
8. Remote monitoring is often used to obtain stored electronic data from site environmental systems. A thorough discussion of this type of electronic field data recording is beyond the scope of this Section. Such on-site systems are generally capable of storing a limited amount of data as a comma-delimited or spreadsheet file. Users must remotely access the monitoring equipment files via modem or other access and download the data. In order to minimize the

potential for loss of data, access and downloading of data should be performed frequently enough to ensure the data storage capacity of the remote equipment is not exceeded.

Equipment/Materials:

- Appropriate field log forms, or iPad® or equivalent with preformatted log forms.
- Indelible ball point pen (do not use “rollerball” or felt-tip style pens);
- Straight edge;
- Pocket calculator; and,
- Laptop computer (if required).

5. Aquifer Characterization

This procedure describes the measurement of water levels in groundwater monitoring.

A synoptic gauging round will be completed to obtain water levels in monitoring wells. Water levels will be acquired in a manner that provides accurate data that can be used to calculate vertical and horizontal hydraulic gradients and other hydrogeologic parameters. Accuracy in obtaining the measurements is critical to ensure the usability of the data.

5.1 PROCEDURE

To provide reliable data, water level monitoring events should be collected over as short of a period of time as practical. Barometric pressure can affect groundwater levels; therefore, observation of significant weather changes during the period of water level measurements must be noted. Rainfall events and groundwater pumping can also affect groundwater level measurements. Personnel collecting water level data must note if any of these controls are in effect during the groundwater level collection period. Due to possible changes during the groundwater level collection period, it is imperative that the time of data collection at each station be accurately recorded. Water levels will also be collected prior to any sample collection that day.

The depth to groundwater will be measured with an electronic depth-indicating probe. Prior to obtaining a measurement, a fixed reference point on the well casing will be established for each well to be measured. Unless otherwise established, the reference point is typically established and marked on the north side of the well casing. Do not use protective casings or flush-mounted road boxes as a reference, due to the potential for damage or settlement. The elevation of the reference point shall be obtained by accepted surveying methods, to the nearest 0.01 ft.

The water level probe will be lowered into the well until the meter indicates (via indicator light or tone) that the water has been reached. The probe will be raised above the water level and slowly lowered again until water is indicated. The cable will be held against the side of the inner protective casing at the point designated for water level measurements and a depth reading taken. This procedure will be followed three times or until a consistent value is obtained. The value will be recorded to the nearest 0.01 ft on the Groundwater Level Monitoring Report form.

Upon completion, the probe will be raised to the surface and, together with the amount of cable that entered the well casing, will be decontaminated in accordance with methods described in the Equipment Decontamination Procedure.

Equipment/Materials:

- Battery-operated, non-stretch electronic water level probe with permanent markings at 0.01-ft increments, such as the Solinst Model 101 or equivalent.
- The calibrated cable on the depth indicator will be checked against a surveyor's steel tape once per quarter year. A new cable will be installed if the cable has changed by more than 0.01 percent (0.01 ft for a 100-ft cable). See also the Field Instruments – Use and Calibration Procedure.
- Groundwater Level Monitoring Report form.

6. Sample Collection for Laboratory Analysis

6.1 SOIL SAMPLE COLLECTION FOR LABORATORY ANALYSIS

The following procedure is an introduction to soil sampling techniques and an outline of field staff responsibilities. All samples will be collected with dedicated sampling equipment.

6.1.1 Preparatory Requirements

Prior to the beginning of any RI or remedial measures activities, staff must attend a project briefing for the purpose of reviewing the project work plan, Site and utility plans, drawings, applicable regulations, sampling location, depth, and criteria, Site contacts, and other related documents. Health and safety concerns will be documented in a Site-specific HASP.

A file folder for the field activities should be created and maintained such that all relevant documents and log forms likely to be useful for the completion of field activities by others are readily available in the event of personnel changes.

6.1.2 Soil Classification

The stratigraphic log is a factual description of the soil at the borehole location and is relied upon to interpret the soil characteristics, their influence, and significance in the subsurface environment. The accuracy of the stratigraphic log is to be verified by the person responsible for interpreting subsurface conditions. An accurate description of the soil stratigraphy is essential for a reasonable understanding of the subsurface conditions. Confirmation of the field description by examination of representative soil samples by the project geologist, hydrogeologist, or geotechnical engineer (whenever practicable) is recommended.

The ability to describe and classify soil correctly is a skill that is learned from a person with experience and by systematic training and comparison of laboratory results to field descriptions.

6.1.2.1 Data Recording

Several methods for classifying and describing soils or unconsolidated sediments are in relatively widespread use. The Unified Soil Classification System (USCS) is the most common. With the USCS, a soil is first classified according to whether it is predominantly coarse-grained or fine-grained.

The description of fill soil is similar to that of natural undisturbed soil except that it is identified as fill and not classified by USCS group, relative density, or consistency. Those logging soils must attempt to distinguish between soils that have been placed (i.e., fill) and not naturally present; or soils that have been naturally present but disturbed (i.e., disturbed native).

It is necessary to identify and group soil samples consistently to determine the subsurface pattern or changes and non-conformities in soil stratigraphy in the field at the time of drilling. The stratigraphy in each borehole during drilling is to be compared to the stratigraphy found at the previously completed boreholes to ensure that patterns or changes in soil stratigraphy are noted and that consistent terminology is used.

Visual examination, physical observations, and manual tests (adapted from ASTM D2488, visual-manual procedures) are used to classify and group soil samples in the field and are summarized in this subsection. ASTM D2488 should be reviewed for detailed explanations of the procedures. Visual-manual procedures used for soil identification and classification include:

- visual determination of grain size, soil gradation, and percentage fines;
- dry strength, dilatancy, toughness, and plasticity (thread or ribbon test) tests for identification of inorganic fine-grained soil (e.g., CL, CH, ML, or MH); and
- soil compressive strength and consistency estimates based on thumb indent and pocket penetrometer (preferred) methods.

Soil characteristics like plasticity, strength, and dilatancy should be determined using the H & A of New York Engineering and Geology, LLP (Haley & Aldrich of New York) Soil Identification Field Form.

6.1.2.2 Field Sample Screening

Upon the collection of soil samples, the soil is screened with a photoionization detector (PID) for the presence of organic vapor. This is accomplished by running the PID across the soil sample. The highest reading and sustained readings are recorded.

Note: The PID measurement must be done upwind of the excavating equipment or any running engines so that exhaust fumes will not affect the measurements.

Another method of field screening is headspace measurements. This consists of placing a portion of the soil sample in a sealable glass jar, placing aluminum foil over the jar top, and tightening the lid. Alternatively, plastic sealable bags may be utilized for a field screen in lieu of glass containers. The jar should only be partially filled. Shake the jar and set aside for at least 30 minutes. After the sample has equilibrated, the lid of the jar can be opened; the foil is punctured with the PID probe, and the air (headspace) above the soil sample is monitored. This headspace reading on the field form or in the field book is recorded. All headspace measurements must be completed under similar conditions to allow comparability of results. Soil classification and PID readings will be recorded in the daily field report.

Equipment/Materials:

- Pocket knife or small spatula
- Small handheld lens
- Stratigraphic Log (Overburden) (Form 2001)
- Tape measure
- When sampling for PFAS, acceptable materials for sampling include stainless steel, high-density polyethylene (HDPE), polyvinyl chloride (PVC), silicone, acetate, and polypropylene.

6.1.3 Soil Sampling

Soil samples will be collected from acetate liners installed by a track-mounted direct-push drill rig (Geoprobe®) operated by a licensed operator. Soil samples will be collected using a stainless-steel trowel or sampling spoon into laboratory-provided sample containers. If it is necessary to relocate any

proposed sampling location due to terrain, utilities, access, etc., the Project Manager must be notified, and an alternate location will be selected.

Prior to use and between each sampling location at an environmental site, the sampling equipment must be decontaminated. All decontamination must be conducted in accordance with the project-specific plans or the methods presented in SOP 7.0.

6.1.4 Sampling Techniques

The following procedure describes typical soil sample collection methods for submission of samples to a laboratory for chemical analysis. The primary goal of soil sampling is to collect representative samples for examination and chemical analysis (if required).

Environmental soil samples obtained for chemical analyses are collected with special attention given to the rationale behind determining the precise zone to sample, the specifics of the method of soil extraction, and the requisite decontamination procedures. Preservation, handling, and glassware for environmental soil samples vary considerably depending upon several factors, including the analytical method to be conducted and the analytical laboratory being used.

Soil sampling for PFAS will be performed in accordance with NYSDEC, DER, Sampling, Analysis and Assessment of PFAS under NYSDEC Part 375 Remedial Program (June 2021).

6.1.4.1 Grab Versus Composite Samples

A grab sample is collected to identify and quantify conditions at a specific location or interval. The sample is comprised of the minimum amount of soil necessary to make up the volume of the sample dictated by the required sample analyses. Composite samples may be obtained from several locations or along a linear trend (in a test pit or excavation). Sampling may occur within or across stratification.

6.2 GROUNDWATER SAMPLE COLLECTION FOR LABORATORY ANALYSIS

The following section describes two techniques for groundwater sampling: “Low-Stress/Low-Flow Methods” and “Typical Sampling Methods.”

“Low-Stress/Low-Flow” methods will be employed when collecting groundwater samples for the evaluation of volatile constituents (i.e., dissolved oxygen [DO]) or in fine-grained formations where sediment/colloid transport is possible. Analyses typically sensitive to colloidal transport issues include PCBs, polyaromatic hydrocarbons (PAHs), and metals.

The “Typical Sampling Methods” will be employed where parameters less sensitive to turbidity/sediment issues are being collected (general chemistry, pesticides, and other SVOCs).

NOTE: If non-aqueous phase liquids (NAPL) (light or dense) are detected in a monitoring well, groundwater sample collection will not be conducted, and the Project Manager must be contacted to determine a course of action.

6.2.1 Preparatory Requirements

- Verify well identification and location using borehole log details and location layout figures. Note the condition of the well and record any necessary repair work required.
- Prior to opening the well cap, measure the breathing space above the well casing with a handheld organic vapor analyzer to establish baseline breathing space VOC levels. Repeat this measurement once the well cap is opened. If either of these measurements exceeds the air quality criteria in the HASP, field personnel should adjust their personal protective equipment (PPE) accordingly.
- Prior to commencing the groundwater purging/sampling, a water level must be obtained to determine the well volume for hydraulic purposes. In some settings, it may be necessary to allow the water level time to equilibrate. This condition exists if a watertight seal exists at the well cap and the water level has fluctuated above the top of screen, creating a vacuum or pressurized area in this air space. Three water level checks will verify that static water level conditions have been achieved.
- Calculate the volume of water in the well. Typically, overburden well volumes consider only the quantity of water standing in the well screen and riser; bedrock well volumes are calculated on the quantity of water within the open core hole and within the overburden casing.

6.2.2 Well Development

Well development is completed to remove fine-grained materials from the well but in such a manner as not to introduce fines from the formation into the sand pack. Well development continues until the well responds to water level changes in the formation (i.e., a good hydraulic connection is established between the well and formation) and the well produces clear, sediment-free water to the extent practical.

- Attach the appropriate pump and lower tubing into the well.
- Gauge well and calculate one-well volume. Turn on the pump. If the well runs dry, shut off the pump and allow it to recover.
- Surging will be performed by raising and lowering the pump several times to pull fine-grained material from the well. Periodically measure the turbidity level using a La Motte turbidity reader.
- The second and third steps will be repeated until turbidity is less than 50 nephelometric turbidity units (NTU) or when 10 well volumes have been removed.
- All water generated during cleaning and development procedures will be collected and contained on the Site in 55-gallon drums for future analysis and appropriate disposal.

Equipment:

- Appropriate health and safety equipment
- Knife
- Power source (generator)
- Field book
- Well Development Form (Form 3006)

- Well keys
- Graduated pails
- Pump and tubing
- Cleaning supplies (including non-phosphate soap, buckets, brushes, laboratory-supplied distilled/deionized water, tap water, cleaning solvent, aluminum foil, plastic sheeting, etc.)
- Water level meter

6.2.3 Well Purging and Stabilization Monitoring (Low-Stress/Low-Flow Method)

The preferred method for groundwater sampling will be the low-stress/low-flow method described below.

- Slowly lower the pump, safety cable, tubing, and electrical lines into the well to the depth specified by the project requirements. The pump intake must be at the midpoint of the well screen to prevent disturbance and resuspension of any sediment in the screen base.
- Before starting the pump, measure the water level again with the pump in the well, leaving the water level measuring device in the well when completed.
- Purge the well at 100 to a maximum of 500 milliliters per minute (mL/min). During purging, the water level should be monitored approximately every five minutes, or as appropriate. A steady flow rate should be maintained that results in a drawdown of 0.3 ft or less. The rate of pumping should not exceed the natural flow rate conditions of the well. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record adjustments made to the pumping rates and water levels immediately after each adjustment.
- During the purging of the well, monitor and record the field indicator parameters (pH, temperature, conductivity, oxidation-reduction [redox] reaction potential [ORP], DO, and turbidity) approximately every five minutes. Stabilization is considered to be achieved when the final groundwater flow rate is achieved, and three consecutive readings for each parameter are within the following limits:
 - pH: 0.1 pH units of the average value of the three readings;
 - Temperature: 3 percent of the average value of the three readings;
 - Conductivity: 0.005 milliSiemen per centimeter (mS/cm) of the average value of the three readings for conductivity less than 1 mS/cm and 0.01 mS/cm of the average value of the three readings for conductivity greater than 1 mS/cm;
 - ORP: 10 millivolts (mV) of the average value of the three readings;
 - DO: 10 percent of the average value of the three readings; and
 - Turbidity: 10 percent of the average value of the three readings, or a final value of less than 50 NTU.
- The pump must not be removed from the well between purging and sampling.

6.2.4 Sampling Techniques

- If an alternate pump is utilized, the first pump discharge volumes should be discarded to allow the equipment a period of acclimation to the groundwater.
- Samples are collected directly from the pump, with the groundwater being discharged directly into the appropriate sample container. Avoid handling the interior of the bottle or bottle cap, and don new gloves for each well sampled to avoid contamination of the sample.
- Order of sample collection:
 - PFAS
 - VOCs
 - 1,4-dioxane
 - SVOCs
 - Total Analyte List (TAL) metals
 - PCBs and pesticides
- 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.
- For low-stress/low-flow sampling, samples should be collected at a flow rate between 100 and 500 mL/min and such that the drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft.
- The pumping rate used to collect a sample for VOC should not exceed 100 mL/min. Samples should be transferred directly to the 40-mL glass vials, the final container, completely full and topped with a Teflon™ cap. Once capped, the vial must be inverted and tapped to check for headspace/air presence (bubbles). If air is present, the sample will be discarded and recollected until free of air.
- Groundwater sampling for PFAS will be performed in accordance with NYSDEC, DER, Sampling, Analysis and Assessment of PFAS under NYSDEC Part 375 Remedial Program (June 2021).
- All samples must be labeled with:
 - A unique sample number
 - Date and time
 - Parameters to be analyzed
 - Project Reference ID
 - Sampler's initials
- Labels should be written in indelible ink and secured to the bottle with clear tape.

Equipment/Materials:

- pH meter, conductivity meter, DO meter, ORP meter, nephelometer, temperature gauge
- Field filtration units (if required)
- Purging/sampling equipment
 - Peristaltic Pump
- Water level probe

- Sampling materials (containers, log book/forms, coolers, chain of custody [COC])
- Work Plan
- HASP
- When sampling for PFAS, acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene.

Note: Peristaltic pump use for VOC collection is not acceptable on NYSDEC/U.S. Environmental Protection Agency (EPA)/Resource Conservation and Recovery Act (RCRA) sites; this technique has gained acceptance in select areas where it is permissible to collect VOCs using a peristaltic pump at a low-flow rate (e.g., Michigan).

Note: 1,4-dioxane and PFAS purge and sample techniques will be conducted following the NYSDEC guidance documents (see Appendix D of the RIWP). Acceptable groundwater pumps include a stainless-steel inertia pump with HDPE tubing, a peristaltic pump equipped with HDPE tubing and silicone tubing, and a stainless-steel bailer with stainless-steel ball or bladder pump (identified as PFAS-free) with HDPE tubing.

Field Notes:

- Field notes must document all the events, equipment used, and measurements collected during the sampling activities. Section 2.0 describes the data/recording procedure for field activities.
- The log book should document the following for each well sampled:
 - Identification of well
 - Well depth
 - Static water level depth and measurement technique
 - Sounded well depth
 - Presence of immiscible layers and detection/collection method
 - Well yield – high or low
 - Purge volume and pumping rate
 - Time well purged
 - Measured field parameters
 - Purge/sampling device used
 - Well sampling sequence
 - Sampling appearance
 - Sample odors
 - Sample volume
 - Types of sample containers and sample identification
 - Preservative(s) used
 - Parameters requested for analysis
 - Field analysis data and method(s)
 - Sample distribution and transporter
 - Laboratory shipped to

- COC number for shipment to laboratory
- Field observations on sampling event
- Name collector(s)
- Climatic conditions including air temperature
- Problems encountered and any deviations made from the established sampling protocol.

Standard log forms for documentation and reporting groundwater purging and sampling events are presented on the Groundwater Sampling Record, Low-Flow Groundwater Sampling Form, and Low-Flow Monitored Natural Attenuation (MNA) Field Sampling Form. Refer to Appendix A for example field forms.

Groundwater/Decon Fluid Disposal:

- Groundwater disposal methods will vary on a case-by-case basis but may range from:
 - Off-site treatment at private treatment/disposal facilities or publicly owned treatment facilities
 - On-site treatment
 - Direct discharge to the surrounding ground surface, allowing groundwater infiltration to the underlying subsurface regime
- Decontamination fluids should be segregated and collected separately from wash waters/groundwater containers.

6.3 SUB-SLAB/SOIL VAPOR SAMPLING

The following procedure is an introduction to soil vapor sampling techniques and an outline of field staff responsibilities.

6.3.1 Preparatory Requirements

Prior to collecting the field sample, ensure the stainless-steel or polyethylene soil vapor probe has been installed to the desired depth and sealed completely to the surface using a material such as bentonite. As part of the vapor intrusion evaluation, a tracer gas should be used in accordance with New York State Department of Health (NYSDOH) protocols to serve as a quality assurance/quality control (QA/QC) device to verify the integrity of the soil vapor probe seal. A container (box, plastic pail, etc.) will serve to keep the tracer gas in contact with the probe during testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer gas prior to sampling. If the tracer sample results show a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration. At the conclusion of the sampling round, tracer monitoring should be performed a second time to confirm the integrity of the probe seals.

6.3.2 Sampling Techniques

Samples will be collected in appropriately sized Summa canisters that have been certified clean by the laboratory, and samples will be analyzed using EPA Method TO-15. Flow rate for both purging and sampling will not exceed 0.2 liters per minute (L/min). One to three implant volumes shall be purged prior to the collection of any soil-gas samples. A sample log sheet will be maintained summarizing

sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone, and COC protocols.

6.4 SAMPLE HANDLING AND SHIPPING

Sample management is the continuous care given to each sample from the point of collection to receipt at the analytical laboratory. Good sample management ensures that samples are properly recorded, properly labeled, and not lost, broken, or exposed to conditions that may affect the sample's integrity.

All sample submissions must be accompanied by a COC document to record sample collection and submission. Personnel performing sampling tasks must check the sample preparation and preservation requirements to ensure compliance with the QAPP.

The following sections provide the minimum standards for sample management.

6.4.1 Sample Handling

Prior to entering the field area where sampling is to be conducted, especially at sites with defined exclusion zones, the sampler should ensure that all materials necessary to complete the sampling are on hand. If samples must be maintained at a specified temperature after collection, dedicated coolers and ice must be available for use. Conversely, when sampling in cold weather, proper protection of water samples, trip blanks, and field blanks must be considered. Sample preservation will involve pH adjustment, cooling to 4 degrees Celsius, and sample filtration and preservation.

6.4.2 Sample Labeling

Samples must be properly labeled immediately upon collection.

Note that the data shown on the sample label is the minimum data required. The sample label data requirements are listed below for clarity.

- Project name
- Sample name/number/unique identifier
- Sampler's initials
- Date of sample collection
- Time of sample collection
- Analysis required
- Preservatives

To ensure that samples are not confused, a clear notation should be made on the container with a permanent marker. If the containers are too soiled for marking, the container can be put into a “Zip Lock” bag, which can then be labeled.

All sample names will be as follows:

- Sample unique identifier: Enter the sample name or number. There should be NO slashes, spaces, or periods in the date.
- Date: Enter the six-digit date when the sample was collected. Note that for one-digit days, months, and/or years, add zeros so that the format is MMDDYY (050210). There should be NO slashes, dashes, or periods in the date.

The QA/QC samples will be numbered consecutively as collected with a sample name, date and number of samples collected throughout the day (i.e., when multiple QA/QC samples are collected in one day).

Examples of this naming convention are as follows:

Sample Name:	Comments
TB-050202-0001	TRIP BLANK
TB-050202-0002	TRIP BLANK
FD-050202-0001	FIELD DUPLICATE
FD-050202-0002	FIELD DUPLICATE

NOTE: The QA/QC Sample # resets to 0001 EACH DAY. This will avoid having to look back to the previous day for the correct sequential number.

6.4.3 Field Code

The field code will be written in the “Comments” field on the COC for EVERY sample but will not be a part of the actual sample name. Enter the one/two-character code for the type of sample (must be in CAPITALS):

N	Normal Field Sample
FD	Field Duplicate (note sample number (i.e., 0001) substituted for time)
TB	Trip Blank (note sample number (i.e., 0001) substituted for time)
EB	Equipment Blank (note sample number (i.e., 0001) substituted for time)
FB	Field Blank (note sample number (i.e., 0001) substituted for time)
KD	Known Duplicate
FS	Field Spike Sample
MS	Matrix Spike Sample (note on “Comments” field of COC – laboratory to spike matrix.
MD	Matrix Spike Duplicate Sample (note on ‘Comments’ field of COC – laboratory to spike matrix.
RM	Reference Material

The sample labeling – both chain and sample bottles must be EXACTLY as detailed above. In addition, the Field Sample Key for each sample collected must be filled out.

6.4.4 Packaging

Sample container preparation and packing for shipment should be completed in a well-organized and clean area, free of any potential cross-contamination. The following is a list of standard guidelines that must be followed when packing samples for shipment.

- Double-bag ice in “Zip Lock” bags.
- Double check to ensure trip and temperature blanks have been included for all shipments containing VOCs, or where otherwise specified in the QAPP.
- Enclose the COC form in a “Zip Lock” bag.
- Containers should be wiped clean of all debris/water using paper towels (paper towels must be disposed of with other contaminated materials).
- Clear, wide packing tape should be placed over the sample label for protection.
- Do not bulk pack. Each sample must be individually padded.
- Large glass containers (1 liter and up) require much more space between containers.
- Ice is not a packing material due to the reduction in volume when it melts.

Note: Never store sterile sample containers in enclosures containing equipment that uses any form of fuel or volatile petroleum-based product. When conducting sampling in freezing conditions at sites without a heated storage area (free of potential cross-contaminants), unused trip blanks should be isolated from coolers immediately after receipt. Trip blanks should be double-bagged and kept from freezing.

6.4.5 Chain-of-Custody Records

COC forms will be completed for all samples collected. The form documents the transfer of sample containers. The COC record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The COC document will be signed and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a COC form. The cooler will be sealed properly for shipment. The laboratory will maintain a copy for its records. One copy will be returned with the data deliverables package.

The following list provides guidance for the completion and handling of all COCs:

- COCs used should be a Haley & Aldrich of New York standard form or supplied by the analytical laboratory.
- COCs must be completed in black ball point ink only.
- COCs must be completed neatly using printed text.
- If a simple mistake is made, cross out the error with a single line and initial and date the correction.
- Each separate sample entry must be sequentially numbered.
- If numerous repetitive entries must be made in the same column, place a continuous vertical arrow between the first entry and the next different entry.
- When more than one COC form is used for a single shipment, each form must be consecutively numbered using the “Page ____ of ____” format.
- If necessary, place additional instructions directly onto the COC in the Comment Section. Do not enclose separate instructions.

- Include a contact name and phone number on the COC in case there is a problem with the shipment.
- Before using an acronym on a COC, clearly define the full interpretation of your designation [i.e., polychlorinated biphenyls (PCBs)].

6.4.6 Shipment

Prior to the start of the field sampling, the carrier should be contacted to determine if pickup will be at the field site location. If pick-up is not available at the Site, the nearest pick-up or drop-off location should be determined. Sample shipments must not be left at unsecured drop locations.

Copies of all shipment manifests must be maintained in the field file.

7. Field Instruments – Use and Calibration

A significant number of field activities involve the use of electronic instruments to monitor for environmental conditions and health and safety purposes. It is imperative that the instruments are used and maintained properly to optimize their performance and minimize the potential for inaccuracies in the data obtained. This section provides guidance on the usage, maintenance, and calibration of electronic field equipment.

- All monitoring equipment will be in proper working order and operated in accordance with manufacturer's recommendations.
- Field personnel will be responsible for ensuring that the equipment is maintained and calibrated in the field in accordance with manufacturer's recommendations.
- Instruments will be operated only by personnel trained in the proper usage and calibration.
- Personnel must be aware of the range of conditions, such as temperature and humidity, for instrument operation. Usage of instruments in conditions outside these ranges will only proceed with approval of the Project Manager and/or Health and Safety Officer as appropriate.
- Instruments that contain radioactive source material, such as x-ray fluorescence (XRF) analyzers or moisture-density gauges, require specific transportation, handling, and usage procedures that are generally associated with a license from the Nuclear Regulatory Commission (NRC) or an NRC-Agreement State. Under no circumstances will the operation of such instruments be allowed on site unless by properly authorized and trained personnel, using the proper personal dosimetry badges or monitoring instruments.

7.1 GENERAL PROCEDURE DISCUSSION

Care must be taken to minimize the potential for transfer of contaminated materials to the ground or onto other materials. Regardless of the size or nature of the equipment being decontaminated, the process will utilize a series of steps that involve removal of gross material (dirt, grease, oil, etc.), washing with a detergent, and multiple rinsing steps. In lieu of a series of washes and rinse steps, steam cleaning with low-volume, high-pressure equipment (i.e., steam cleaner) is acceptable.

Exploration equipment, and all monitoring equipment in contact with the sampling media must be decontaminated prior to initiating site activities, in between exploration locations to minimize cross-contamination, and prior to mobilizing off site after completion of site work.

The following specific decontamination procedure is recommended for sampling equipment and tools:

- Brush loose soil off equipment;
- Wash equipment with laboratory-grade detergent (i.e., Alconox or equivalent);
- Rinse with tap water;
- Rinse equipment with distilled water;
- Allow water to evaporate before reusing equipment; and
- Wrap equipment in aluminum foil when not being used.

7.2 DECONTAMINATION OF MONITORING EQUIPMENT

Because monitoring equipment is difficult to decontaminate, care should be exercised to prevent contamination. Sensitive monitoring instruments should be protected when they are at risk of exposure to contaminants. This may include enclosing them in plastic bags, allowing an opening for the sample intake. Ventilation ports should not be covered.

If contamination does occur, decontamination of the equipment will be required; however, immersion in decontamination fluids is not possible. As such, care must be taken to wipe the instruments down with detergent-wetted wipes or sponges, and then with de-ionized water-wetted wipes or sponges.

7.3 DISPOSAL OF WASH SOLUTIONS AND CONTAMINATED EQUIPMENT

All contaminated wash water, rinses, solids, and materials used in the decontamination process that cannot be effectively decontaminated (such as polyethylene sheeting) will be containerized and disposed of in accordance with applicable regulations. All containers will be labeled with an indelible marker as to contents and date of placement in the container, and any appropriate stickers required (such as PCBs). Storage of decontamination wastes on site will not exceed 90 days under any circumstances.

Equipment/Materials:

Decontamination equipment and solutions are generally selected based on ease of decontamination and disposability.

- Polyethylene sheeting;
- Metal racks to hold equipment;
- Soft-bristle scrub brushes or long-handle brushes for removing gross contamination and scrubbing with wash solutions;
- Large galvanized wash tubs, stock tanks, or wading pools for wash and rinse solutions;
- Plastic buckets or garden sprayers for rinse solutions;
- Large plastic garbage cans or other similar containers lined with plastic bags can be used to store contaminated clothing; and
- Contaminated liquids and solids should be segregated and containerized in New York State Department of Transportation (NYSDOT)-approved plastic or metal drums, appropriate for offsite shipping/disposal if necessary.

8. Investigation-Derived Waste Disposal

8.1 RATIONALE/ASSUMPTIONS

This procedure applies to the disposition of IDW, including soils and/or groundwater. IDW is dealt with the following “Best Management Practices” and is not considered a listed waste due to the lack of generator knowledge concerning chemical source, chemical origin, and timing of chemical introduction to the subsurface.

Consequently, waste sampling and characterization are performed to determine if the wastes exhibit a characteristic of hazardous waste. The disposal of soil cuttings, test pit soils, and/or purged groundwater will be reviewed on a case-by-case basis prior to initiation of field activities. Two scenarios typically exist:

- When no information is available in the area of activity or investigation, and impacted media/soils are identified. Activities such as new construction and /or maintenance below grade may encounter environmental conditions that were unknown.
- Disposal Required/Containerization Required – When sufficient Site information regarding the investigative Site conditions warrants that all materials handled will be contained and disposed.

If a known listed hazardous and/or characteristically hazardous waste/contaminated environmental media is being handled, then handling must be performed in accordance with RCRA Subtitle C (reference 2, Part V, Section 1(a),(b),(c)).

The following outlines the waste characterization procedures to be employed when IDW disposal is required.

The following procedure describes the techniques for characterization of IDW for disposal purposes. IDW may consist of soil cuttings (augering, boring, well installation soils, test pit soils), rock core or rock flour (from coring, reaming operations), groundwater (from well development, purging, and sampling activities), decontamination fluids, PPE, and disposal equipment (DE).

8.2 PROCEDURE

The procedures for handling and characterization of field activity-generated wastes are:

- A.) Soil Cuttings - Soils removed from boring activities will be contained within an approved container, suitable for transportation and disposal.
- Once placed into the approved container, any free liquids (i.e., groundwater) will be removed for disposal as waste fluids or solidified within the approved container using a solidification agent such as Speedy Dri (or equivalent).
 - Contained soils will be screened for the presence of VOCs, using a PID; this data will be logged for future reference.

- Once screened, full, and closed, the container will be labeled and placed into the container storage area. At a minimum, the following information will be shown on each container label: date of filling/generation, Site name, source of soils (i.e., borehole or well), and contact.
- Prior to container closure, representative samples from the containers will be collected for waste characterization purposes and submitted to the project laboratory.
- Typically, at a location where an undetermined site-specific parameter group exists, sampling and analysis may consist of the full RCRA Waste Characterization (ignitability, corrosivity, reactivity, toxicity), or a subset of the above based upon data collected, historical information, and generator knowledge.

B.) Groundwater - purging and sampling groundwater, which requires disposal, will be contained.

- Containment may be performed in 55-gallon drums, tanks suitable for temporary storage (i.e., Nalgene tanks 500 to 1,000 gallons), or, if large volumes of groundwater are anticipated, a tanker trailer (5,000 to 10,000 gallons \pm) or drilling "Frac" tanks may be utilized (20,000 gallons \pm). In all cases, the container/tank used for groundwater storage must be clean before use, such that cross-contamination does not occur.

C.) Decon Waters/Decon Fluids - Decon waters and/or fluids will be segregated, contained, and disposed accordingly.

- Decon waters may be disposed of with the containerized groundwater once analytical results have been acquired.

D.) PPE/DE – A number of disposal options exist for spent PPE/DE generated from investigation tasks. The options typically employed are:

- Immediately disposed of within on-Site dumpster/municipal trash; or
- If known to be contaminated with RCRA hazardous waste, dispose off-Site at an RCRA Subtitle C facility.
- Spent Solvent/Acid Rinses - The need for sampling must be determined in consultation with the waste management organization handling the materials. If known that only the solvent and/or acids are present, then direct disposal/treatment using media-specific options may be possible without sampling (i.e., incineration).
- PPE/DE – Typically not sampled and included with the disposal of the solid wastes.

Equipment/Materials:

- Sample spoons, trier, auger,
- Sample mixing bowl,
- Sampling bailer, or pump,
- Sample glassware.

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25. Geotechnical Gauge, Manufactured by W.F. McCollough, Beltsville, MD.
26. New York State Code Rule 753
27. New York State Department of Environmental Conservation Technical Guidance for Site Investigation and Remediation, DER-10, (May 3, 2010).
28. New York State Department of Environmental Conservation, Division of Environmental Remediation, Sampling, Analysis and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC Part 375 Remedial Program (June 2021).
29. Occupational Safety and Health Administration (OSHA), Excavation and Trenching Standard Title 29 of the Code of Federal Regulation (CFR) Part 1926.650.
30. Sand Grading Chart, by Geological Specialty Company, Northport, Alabama.

APPENDIX A

Field Forms

EQUIPMENT CALIBRATION LOG

Project:**Location:****Model Name:****Model Number:**

Serial Number:

Cal. Standards:

Instruments will be calibrated in accordance with manufacturer's recommendations at least once per day.

[illegible]**Other Comments:**

Location:

Well ID: _____

Date: _____

Start Time: _____

Finished Time: _____

Initial Depth to Water: _____ Purging Device: _____

Well Depth: _____ Tubing present in well? _____

Depth to top of screen: _____ Tubing type: _____

Depth to bottom of screen: _____

Depth of Pump Intake: _____

[illegible]

Comments:

SAMPLE IDENTIFICATION KEY

Page of

PROJECT _____
 LOCATION _____
 CLIENT _____
 CONTRACTOR _____

H&A FILE NO. _____

PROJECT MGR. _____

[illegible]

Notes:

Common Sample Type Codes:

N Normal Environmental Sample	WG Groundwater	WS Surface Water	SO Soil	GS Soil Gas	SE Sediment
WQ Water for Quality Control	FD Field Duplicate	EB Equipment Blank	TB Trip Blank	MS Matrix Spike	MSD Matrix Spike Duplicate

see Memorandum dated 08/08/05 from Melanie Satanek "Sample Labeling for Submission to Analytical Laboratory" for less common codes

DAILY FIELD REPORT

Page of

Project

Report No.

Location

Date _____

Client

Page

Contractor

File No.

Weather

Temperature

Field Representative(s)

Time on site

Report/Travel/OtherTotal hours

Distribution:

Haley & Aldrich, Inc.

BORING NO.

Page 1 of

DATE FINISHED

[illegible]

Summary

Overburden (Linear ft.) _____
 Rock Cored (Linear ft.) _____
 Number of Samples _____

BORING NO.

NOTE: Soil descriptions based on a modified Burmister method of visual-manual identification

APPENDIX C

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN
FORMER TILSDALE LUMBER AND COAL REDEVELOPMENT SITE
8-01 AND 8-51 26TH AVENUE
QUEENS, NEW YORK

by
H & A of New York Engineering and Geology, LLP
New York, New York

for
KS Astoria LLC
Newark, New Jersey

File No. 0211417-001
December 2025



Executive Summary

This Quality Assurance Project Plan (QAPP) outlines the scope of the quality assurance and quality control (QA/QC) activities associated with the site monitoring activities as stipulated in the Remedial Investigation Work Plan (RIWP) for the Former Tilsdale Lumber and Coal Redevelopment Site (Site) located at 8-01 and 8-51 26th Avenue in Queens, New York.

Protocols for sample collection, sample handling and storage, chain-of-custody procedures, and laboratory and field analyses are described herein or specifically referenced to related project documents.

Table of Contents

	Page
Executive Summary	i
List of Tables	v
1. Project Description	1
1.1 PROJECT OBJECTIVES	1
1.2 SITE DESCRIPTION AND HISTORY	1
1.3 LABORATORY PARAMETERS	1
1.4 SAMPLING LOCATIONS	2
2. Project Organization and Responsibilities	3
2.1 MANAGEMENT RESPONSIBILITIES	3
2.2 QUALITY ASSURANCE RESPONSIBILITIES	3
2.2.1 Quality Assurance (QA) Officer	3
2.2.2 Data Validation Staff	3
2.3 LABORATORY RESPONSIBILITIES	4
2.3.1 Laboratory Project Manager	4
2.3.2 Laboratory Operations Manager	4
2.3.3 Laboratory QA Officer	4
2.3.4 Laboratory Sample Custodian	4
2.3.5 Laboratory Technical Personnel	4
2.4 FIELD RESPONSIBILITIES	5
2.4.1 Field Coordinator	5
2.4.2 Field Team Personnel	5
3. Sampling Procedures	6
3.1 SAMPLE CONTAINERS	6
3.2 SAMPLE LABELING	6
3.3 FIELD QC SAMPLE COLLECTION	6
3.3.1 Field Duplicate Sample Collection	6
4. Custody Procedures	8
4.1 FIELD CUSTODY PROCEDURES	8
4.1.1 Field Procedures	9
4.1.2 Transfer of Custody and Shipment Procedures	9
4.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES	9
4.3 STORAGE OF SAMPLES	10
4.4 FINAL PROJECT FILES CUSTODY PROCEDURES	10
5. Calibration Procedures and Frequency	12

Table of Contents

	Page
5.1 FIELD INSTRUMENT CALIBRATION PROCEDURES	12
5.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES	12
6. Analytical Procedures	13
6.1 FIELD ANALYTICAL PROCEDURES	13
6.2 LABORATORY ANALYTICAL PROCEDURES	13
6.2.1 List of Project Target Compounds and Laboratory Detection Limits	13
6.2.2 List of Method-Specific Quality Control (QC) Criteria	13
7. Internal Quality Control Checks	14
7.1 FIELD QUALITY CONTROL	14
7.1.1 Field Blanks	14
7.1.2 Trip Blanks	14
7.2 LABORATORY PROCEDURES	14
7.2.1 Field Duplicate Samples	14
7.2.2 Matrix Spike Samples	15
7.2.3 Laboratory Control Sample Analyses	15
7.2.4 Surrogate Compound/Internal Standard Recoveries	15
7.2.5 Calibration Verification Standards	16
7.2.6 Laboratory Method Blank Analyses	16
8. Data Quality Objectives	17
8.1 PRECISION	17
8.1.1 Definition	17
8.1.2 Field Precision Sample Objectives	17
8.1.3 Laboratory Precision Sample Objectives	17
8.2 ACCURACY	18
8.2.1 Definition	18
8.2.2 Field Accuracy Objectives	18
8.3 LABORATORY ACCURACY OBJECTIVES	18
8.4 REPRESENTATIVENESS	19
8.4.1 Definition	19
8.4.2 Measures to Ensure Representativeness of Field Data	19
8.5 COMPLETENESS	19
8.5.1 Definition	19
8.5.2 Field Completeness Objectives	19
8.5.3 Laboratory Completeness Objectives	19
8.6 COMPARABILITY	19
8.6.1 Definition	19
8.6.2 Measures to Ensure Comparability of Laboratory Data	20
8.7 LEVEL OF QUALITY CONTROL EFFORT	20

Table of Contents

	Page
9. Data Reduction, Validation, and Reporting	21
9.1 DATA REDUCTION	21
9.1.1 Field Data Reduction Procedures	21
9.1.2 Laboratory Data Reduction Procedures	21
9.1.3 Quality Control Data	21
9.2 DATA VALIDATION	21
9.3 DATA REPORTING	22
10. Performance and System Audits	23
10.1 FIELD PERFORMANCE AND SYSTEM AUDITS	23
10.1.1 Internal Field Audit Responsibilities	23
10.1.2 External Field Audit Responsibilities	23
10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS	23
10.2.1 Internal Laboratory Audit Responsibilities	23
10.2.2 External Laboratory Audit Responsibilities	24
11. Preventive Maintenance	25
11.1 FIELD INSTRUMENT PREVENTIVE MAINTENANCE	25
11.2 LABORATORY INSTRUMENT PREVENTIVE MAINTENANCE	25
12. Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness	26
12.1 FIELD MEASUREMENTS	26
12.2 LABORATORY DATA	26
13. Quality Assurance Reports	27
References	28

List of Tables

Table No.	Title
I	Summary of Analysis Method, Preservation Method, Holding Time, Sample Size Requirements, and Sample Containers

1. Project Description

This Quality Assurance Project Plan (QAPP) has been prepared as a component of the Remedial Investigation Work Plan (RIWP) for the Former Tilsdale Lumber and Coal Redevelopment Site located at 8-01 and 8-51 26th Avenue in Queens, New York (the “Site”).

1.1 PROJECT OBJECTIVES

The primary objective for data collection activities is to collect sufficient data necessary to confirm the results of the previous Site characterization activities, potentially identify an on-site source, and determine a course for remedial action. In addition, a qualitative exposure assessment will be conducted and will consider the nature of populations currently exposed or that have the potential to be exposed to Site-related contaminants both on- and off-site, along with describing the reasonably anticipated future land use of the site and affected off-site areas.

1.2 SITE DESCRIPTION AND HISTORY

The general Site description and Site history are provided in the Site Description and History Summary that accompanies the RIWP appended to the Brownfield Cleanup Program (BCP) Application for the Site and incorporated herein by reference.

1.3 LABORATORY PARAMETERS

The laboratory parameters for soil include:

- Target Compound List (TCL) volatile organic compounds (VOCs) using U.S. Environmental Protection Agency (USEPA) Method 8260C
- TCL semi-volatile organic compounds (SVOCs) using USEPA Method 8270D
- Total Analyte List (TAL) metals (including total and hexavalent chromium, and cyanide) using USEPA Method 6010C
- Polychlorinated biphenyls (PCBs) using USEPA Method 8082A
- TCL pesticides using USEPA Method 8081B for historic fill samples
- Per- and polyfluoroalkyl substances (PFAS) using USEPA Method 1633
- 1,4-dioxane using USEPA Method 8270 SIM

The laboratory parameters for groundwater include:

- TCL VOCs using USEPA Method 8260B
- TCL SVOCs using USEPA Method 8270C
- TAL metals using USEPA Methods 6010/7471
- PCBs using USEPA Method 8082
- Pesticides by USEPA Method 8081B
- PFAS using USEPA Method 1633

- 1,4-dioxane using USEPA Method 8270D SIM isotope dilution

Note: PFAS sampling techniques will be conducted following the New York State Department of Environmental Conservation's (NYSDEC's) Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances – Under NYSDEC's Part 375 Remedial Programs (November 2022).

During the collection of groundwater samples, pH, specific conductivity, temperature, dissolved oxygen (DO), and oxidation/reduction potential (ORP) will be measured until stabilized.

The laboratory parameter for soil vapor, indoor air, and ambient air includes:

- VOCs using USEPA Method TO-15

Laboratory parameters for disposal samples will be determined by the disposal facility after an approved facility has been determined.

1.4 SAMPLING LOCATIONS

Figure 2 of the RIWP provides the locations of soil borings, soil vapor points, indoor air/ambient air locations, and groundwater monitoring wells that will be sampled.

2. Project Organization and Responsibilities

This section defines the roles and responsibilities of the individuals who will perform the RIWP monitoring activities. A New York State Department of Health (NYSDOH)-certified analytical laboratory will perform the analyses of environmental samples collected at the Site.

2.1 MANAGEMENT RESPONSIBILITIES

The Project Manager is responsible for managing the implementation of the RIWP and monitoring and coordinating the collection of data. The Project Manager is responsible for technical quality control (QC) and project oversight. The Project Manager's responsibilities include the following:

- Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule restraints;
- Review work performed to ensure quality, responsiveness, and timeliness;
- Communicate with the client point of contact concerning the progress of the monitoring activities;
- Assure corrective actions are taken for deficiencies cited during audits of RIWP monitoring activities; and
- Overall Site Health and Safety Plan (HASP) compliance.

2.2 QUALITY ASSURANCE RESPONSIBILITIES

The Quality Assurance (QA) team will consist of a QA Officer and the Data Validation Staff. QA responsibilities are described as follows:

2.2.1 Quality Assurance (QA) Officer

The QA Officer reports directly to the Project Manager and will be responsible for overseeing the review of field and laboratory data. Additional responsibilities include the following:

- Assure the application and effectiveness of the QAPP by the analytical laboratory and the project staff;
- Provide input to the Project Manager as to corrective actions that may be required as a result of the above-mentioned evaluations; and
- Prepare and/or review data validation and audit reports.

The QA Officer will be assisted by the Data Validation staff in the evaluation and validation of field and laboratory-generated data.

2.2.2 Data Validation Staff

The Data Validation Staff will be independent of the laboratory and familiar with the analytical procedures performed. The validation will include a review of each validation criterion as prescribed by

the guidelines presented in Section 9.2 of this document and will be presented in a Data Usability Summary Report (DUSR) for submittal to the QA Officer.

2.3 LABORATORY RESPONSIBILITIES

Laboratory services in support of the RIWP monitoring include the following personnel:

2.3.1 Laboratory Project Manager

The Laboratory Project Manager will report directly to the QA Officer and Project Manager and will be responsible for ensuring all resources of the laboratory are available on an as-required basis. The Laboratory Project Manager will also be responsible for the approval of the final analytical reports.

2.3.2 Laboratory Operations Manager

The Laboratory Operations Manager will report to the Laboratory Project Manager and will be responsible for coordinating laboratory analysis, supervising in-house chain-of-custody reports, scheduling sample analyses, overseeing data review, and overseeing preparation of analytical reports.

2.3.3 Laboratory QA Officer

The Laboratory QA Officer will have sole responsibility for the review and validation of the analytical laboratory data. The Laboratory QA Officer will provide Case Narrative descriptions of any data quality issues encountered during the analyses conducted by the laboratory. The QA Officer will also define appropriate QA procedures, overseeing QA/QC documentation.

2.3.4 Laboratory Sample Custodian

The Laboratory Sample Custodian will report to the Laboratory Operations Manager and will be responsible for the following:

- Receive and inspect the incoming sample containers;
- Record the condition of the incoming sample containers;
- Sign appropriate documents;
- Verify chain-of-custody and its correctness;
- Notify the Project Manager and Operations Manager of sample receipt and inspection;
- Assign a unique identification number and enter each into the sample receiving log;
- Initiate transfer of samples to laboratory analytical sections; and
- Control and monitor access/storage of samples and extracts.

2.3.5 Laboratory Technical Personnel

The Laboratory Technical Staff will have the primary responsibility for the performance of sample analysis and the execution of the QA procedures developed to determine the data quality. These

activities will include the proper preparation and analysis of the project samples in accordance with the laboratory's Quality Assurance Manual (QAM) and associated Standard Operating Procedures (SOPs).

2.4 FIELD RESPONSIBILITIES

2.4.1 Field Coordinator

The Field Coordinator is responsible for the overall operation of the field team and reports directly to the Project Manager. The Field Coordinator works with the project Health & Safety Officer (HSO) to conduct operations in compliance with the project HASP. The Field Coordinator will facilitate communication and coordinate efforts between the Project Manager and the field team members.

Other responsibilities include the following:

- Develop and implement field-related work plans, ensuring schedule compliance, and adhering to management-developed project requirements;
- Coordinate and manage field staff;
- Perform field system audits;
- Oversee QC for technical data provided by the field staff;
- Prepare and approve text and graphics required for field team efforts;
- Coordinate and oversee technical efforts of subcontractors assisting the field team;
- Identify problems in the field, resolve difficulties in consultation with the Project QA Officer and Project Manager, and implement and document corrective action procedures; and
- Participate in preparation of the final reports.

2.4.2 Field Team Personnel

Field Team Personnel will be responsible for the following:

- Perform field activities as detailed in the RIWP and in compliance with the Field Sampling Plan (FSP) and QAPP.
- Immediately report any accidents and/or unsafe conditions to the Site HSO and take reasonable precautions to prevent injury.

3. Sampling Procedures

The FSP provides the SOPs for sampling required by the RIWP. Sampling will be conducted in general accordance with the NYSDEC Technical Guidance for Site Investigation and Remediation (Division of Environmental Remediation [DER]-10) and the Sampling, Analysis and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC Part 375 Remedial Program when applicable.

3.1 SAMPLE CONTAINERS

Sample containers for each sampling task will be provided by the laboratory performing the analysis. The containers will be cleaned by the manufacturer to meet or exceed the analyte specifications established in the USEPA's "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers," April 1992, OSWER Directive #9240.0-0.5A. Certificates of analysis for each lot of sample containers used will be maintained by the laboratory.

The appropriate sample containers, preservation method, maximum holding times, and handling requirements for each sampling task are provided in Table I.

3.2 SAMPLE LABELING

Each sample will be labeled with a unique sample identifier that will facilitate tracking and cross-referencing of sample information. Equipment rinse blank and field duplicate samples will also be numbered with a unique sample identifier to prevent analytical bias of field QC samples.

Refer to the FSP for the sample labeling procedures.

3.3 FIELD QC SAMPLE COLLECTION

3.3.1 Field Duplicate Sample Collection

3.3.1.1 *Water Samples*

Field duplicate samples will be collected by filling the first sample container to the proper level and sealing and then repeating for the second set of sample containers.

1. The samples are properly labeled as specified in Section 3.2.
2. Steps 1 through 4 are repeated for the bottles for each analysis. The samples are collected in order of decreasing analyte volatility as detailed in Section 3.3.1.
3. Chain-of-custody documents are executed.
4. The samples will be handled as specified in Table I.

3.3.1.2 *Soil Samples*

Soil field duplicates will be collected as specified in the following procedure:

1. Soils will be sampled directly from acetate liners.

2. Soil for VOC analysis will be removed from the sampling device as specified in the FSP.
3. Soil for non-VOC analysis will be removed from the sampling device and collected into clean laboratory-provided containers.

4. Custody Procedures

Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final project files. Custody of a sample begins when it is collected by or transferred to an individual and ends when that individual relinquishes or disposes of the sample.

A sample is under custody if:

1. The item is in actual possession of a person;
2. The item is in the view of the person after being in actual possession of the person;
3. The item was in actual possession and subsequently stored to prevent tampering; or
4. The item is in a designated and identified secure area.

4.1 FIELD CUSTODY PROCEDURES

Field personnel will keep written records of field activities on applicable preprinted field forms or in a bound field notebook to record data collecting activities. These records will be written legibly in ink and will contain pertinent field data and observations. Entry errors or changes will be crossed out with a single line, dated, and initialed by the person making the correction. Field forms and notebooks will be periodically reviewed by the Field Coordinator.

The beginning of each entry in the logbook or preprinted field form will contain the following information:

- Date;
- Start time;
- Weather;
- Names of field personnel (including subcontractors);
- Level of personal protection used at the Site; and
- Names of all visitors and the purpose of their visit.

For each measurement and sample collected, the following information will be recorded:

- Detailed description of sample location;
- Equipment used to collect the sample or make the measurement and the date the equipment was calibrated;
- Time sample was collected;
- Description of the sample conditions;
- Depth sample was collected (if applicable);
- Volume and number of containers filled with the sample; and,

- Sampler's identification.

4.1.1 Field Procedures

The following procedure describes the process to maintain the integrity of the samples:

- Upon collection, samples are placed in the proper containers. In general, samples collected for organic analysis will be placed in pre-cleaned glass containers, and samples collected for inorganic analysis will be placed in pre-cleaned plastic (polyethylene) bottles. Refer to the FSP for sample packaging procedures.
- Samples will be assigned a unique sample number and will be affixed to a sample label. Refer to the FSP for sample labeling procedures.
- Samples will be properly and appropriately preserved by field personnel in order to minimize loss of the constituent(s) of interest due to physical, chemical, or biological mechanisms.
- Appropriate volumes will be collected to ensure that the appropriate reporting limits can be successfully achieved and that the required QC sample analyses can be performed.

4.1.2 Transfer of Custody and Shipment Procedures

- A chain-of-custody record will be completed at the time of sample collection and will accompany each shipment of project samples to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require the individuals relinquishing and receiving the samples to sign, date, and note the time of sample transfer on the chain of custody record.
- Samples will be shipped or delivered in a timely fashion to the laboratory so that holding times and/or analysis times as prescribed by the methodology can be met.
- Samples will be transported in containers (coolers) that will maintain the refrigeration temperature for those parameters for which refrigeration is required in the prescribed preservation protocols.
- Samples will be placed in an upright position and limited to one layer of samples per cooler. Additional bubble wrap or packaging material will be added to fill the cooler. Shipping containers will be secured with strapping tape and custody tape for shipment to the laboratory.
- When samples are split with the NYSDEC representatives, a separate chain-of-custody will be prepared and marked to indicate with whom the samples are shared. The person relinquishing the samples will require the representative's signature acknowledging sample receipt.
- Samples will be picked up by a laboratory courier or transported to the laboratory the same day they are collected, unless collected on a weekend or holiday. In these cases, the samples will be stored in a secure location until delivery to the laboratory. Additional ice will be added to the cooler as needed to maintain proper preservation temperatures.

4.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

A Sample Custodian will be designated by the laboratory and will have the responsibility to receive all incoming samples. Once received, the custodian will document if the sample is received in good

condition (i.e., unbroken, cooled, etc.) and that the associated paperwork, such as chain-of-custody forms, has been completed. The custodian will sign the chain-of-custody forms.

The custodian will also document if sufficient sample volume has been received to complete the analytical program. The Sample Custodian will then place the samples into secure, limited-access storage (refrigerated storage, if required). The Sample Custodian will assign a unique number to each incoming sample for use in the laboratory. The unique number will then be entered into the sample-receiving log, with the verified time and date of receipt also noted.

Consistent with the analyses requested on the chain-of-custody form, analyses by the laboratory's analysts will begin in accordance with the appropriate methodologies. Samples will be removed from secure storage with internal chain-of-custody sign-out procedures followed.

4.3 STORAGE OF SAMPLES

Empty sample bottles will be returned to secure and limited-access storage after the available volume has been consumed by the analysis. Upon completion of the entire analytical work effort, samples will be disposed of by the Sample Custodian. The length of time that samples are held will be at least 30 days after reports have been submitted. Disposal of remaining samples will be completed in compliance with all federal, state, and local requirements.

4.4 FINAL PROJECT FILES CUSTODY PROCEDURES

The final project files will be the central repository for all documents with information relevant to sampling and analysis activities as described in this QAPP. The H & A of New York Engineering and Geology, LLP (Haley & Aldrich of New York) Project Manager will be the custodian of the project file. The project files, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, and data reviews, will be maintained in a secured, limited-access area and under custody of the Project Director or their designee.

The final project file will include the following:

- Project plans and drawings;
- Field data records;
- Sample identification documents and soil boring/monitoring well logs;
- All chain-of-custody documentation;
- Correspondence;
- References, literature;
- Laboratory data deliverables;
- Data validation and assessment reports;
- Progress reports, QA reports; and
- Final report.

The laboratory will be responsible for maintaining analytical logbooks, laboratory data, and sample chain of custody documents. Raw laboratory data files and copies of hard copy reports will be inventoried and maintained by the laboratory for a period of six years, at which time the laboratory will contact the Haley & Aldrich of New York Project Manager regarding the disposition of the project-related files.

5. Calibration Procedures and Frequency

5.1 FIELD INSTRUMENT CALIBRATION PROCEDURES

Several field instruments will be used for both on-site screening of samples and for health and safety monitoring, as described in the HASP. On-site air monitoring for health and safety purposes may be accomplished using a vapor detection device, such as a photoionization detector (PID).

Field instruments will be calibrated at the beginning of each day and checked during field activities to verify performance. Instrument-specific calibration procedures will be performed in accordance with the instrument manufacturer's requirements.

5.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES

Reference materials of known purity and quality will be utilized for the analysis of environmental samples. The laboratory will carefully monitor the preparation and use of reference materials, including solutions, standards, and reagents, through well-documented procedures.

All solid chemicals and acids/bases used by the laboratory will be rated as "reagent grade" or better. All gases will be "high" purity or better. All Standard Reference Materials (SRMs) or Performance Evaluation (PE) materials will be obtained from approved vendors of the National Institute of Standards and Technology (NIST, formerly National Bureau of Standards), the USEPA Environmental Monitoring Support Laboratories (EMSL), or reliable Cooperative Research and Development Agreement (CRADA)-certified commercial sources.

6. Analytical Procedures

Analytical procedures to be utilized for analysis of environmental samples will be based on referenced USEPA analytical protocols and/or project-specific SOP.

6.1 FIELD ANALYTICAL PROCEDURES

Field analytical procedures include the measurement of pH, temperature, ORP, DO, and specific conductivity during sampling of groundwater, and the qualitative measurement of VOCs during the collection of soil samples.

6.2 LABORATORY ANALYTICAL PROCEDURES

Laboratory analyses will be based on the USEPA methodology requirements promulgated in:

- “Test Methods for Evaluating Solid Waste,” SW-846 EPA, Office of Solid Waste, and promulgated updates, 1986.

6.2.1 List of Project Target Compounds and Laboratory Detection Limits

The laboratory reporting limits (RLs) and associated method detection limits (MDLs) for the target analytes and compounds for the environmental media to be analyzed are presented in Table I. MDLs have been experimentally determined by the project laboratory using the method provided in 40 CFR, Part 136, Appendix B.

Laboratory parameters for soil samples are listed in the RIWP. Laboratory parameters for disposal samples will be determined by the disposal facility after an approved facility has been determined.

6.2.2 List of Method-Specific Quality Control (QC) Criteria

The laboratory SOPs include a section that presents the minimum QC requirements for the project analyses. Section 7.0 references the frequency of the associated QC samples for each sampling effort and matrix.

7. Internal Quality Control Checks

This section presents the internal QC checks that will be employed for field and laboratory measurements.

7.1 FIELD QUALITY CONTROL

7.1.1 Field Blanks

Internal QC checks will include analysis of field blanks to validate equipment cleanliness. Whenever possible, dedicated equipment will be employed to reduce the possibility of cross-contamination of samples.

7.1.2 Trip Blanks

Trip blanks samples will be prepared by the project laboratory using ASTM Type II or equivalent water placed within pre-cleaned 40-milliliter (mL) VOC vials equipped with Teflon™ septa. Trip blanks will accompany each sample delivery group (SDG) of environmental samples collected for analysis of VOCs.

Trip blank samples will be placed in each cooler that stores and transports project samples that are to be analyzed for VOCs.

7.2 LABORATORY PROCEDURES

Procedures which contribute to maintenance of overall laboratory QA/QC control include appropriately cleaned sample containers, proper sample identification and logging, applicable sample preservation, storage, and analysis within prescribed holding times, and use of controlled materials.

7.2.1 Field Duplicate Samples

The precision or reproducibility of the data generated will be monitored through the use of field duplicate samples. Field duplicate analysis will be performed at a frequency of one in 20 project samples.

Precision will be measured in terms of the absolute value of the relative percent difference (RPD) as expressed by the following equation:

$$RPD = [|R1 - R2| / [(R1 + R2) / 2]] \times 100\%$$

Acceptance criteria for duplicate analyses performed on solid matrices will be 100 percent, and aqueous matrices will be 35 percent. RPD values outside these limits will require an evaluation of the sampling and/or analysis procedures by the Project QA Officer and/or Laboratory QA Director. Corrective actions may include re-analysis of additional sample aliquots and/or qualification of the data for use.

7.2.2 Matrix Spike Samples

Ten percent of each project sample matrix for each analytical method performed will be spiked with known concentrations of the specific target compounds/analytes.

The amount of the compound recovered from the sample compared to the amount added will be expressed as a percent recovery. The percent recovery of an analyte is an indication of the accuracy of an analysis within the site-specific sample matrix. Percent recovery will be calculated for matrix spike/matrix spike duplicate (MS/MSD) using the following equation:

$$\% \text{ Recovery} = \frac{\text{Spiked Sample} - \text{Background}}{\text{Known Value of Spike}} \times 100\%$$

If the QC value falls outside the upper or lower control limits (UCL or LCL) due to sample matrix effects, the results will be reported with appropriate data qualifiers. To determine the effect a non-compliant MS recovery has on the reported results, the recovery data will be evaluated as part of the validation process.

7.2.3 Laboratory Control Sample Analyses

The laboratory will perform laboratory control sample (LCS) analyses prepared from SRMs. The SRMs will be supplied from an independent manufacturer and traceable to NIST materials with known concentrations of each target analyte to be determined by the analytical methods performed. In cases where an independently supplied SRM is not available, the LCS may be prepared by the laboratory from a reagent lot other than that used for instrument calibration.

The laboratory will evaluate LCS analyses in terms of percent recovery using the most recent laboratory-generated control limits.

LCS recoveries that do not meet acceptance criteria will be deemed invalid. Analysis of project samples will cease until an acceptable LCS analysis has been performed. If sample analysis is performed in association with an out-of-control LCS sample analysis, the data will be deemed invalid.

Corrective actions will be initiated by the Haley & Aldrich of New York QA Officer and/or Laboratory QA Officer to investigate the problem. After the problem has been identified and corrected, the solution will be noted in the instrument run logbook, and re-analysis of project samples will be performed, if possible.

The analytical anomaly will be noted in the SDG Case Narrative and reviewed by the Data Validator. The Data Validator will confirm that appropriate corrective actions were implemented and recommend the applicable use of the affected data.

7.2.4 Surrogate Compound/Internal Standard Recoveries

For VOCs, surrogates will be added to each sample prior to analysis to establish purge and trap efficiency. Quantitation will be accomplished via internal standardization techniques.

The recovery of surrogate compounds and internal standards will be monitored by laboratory personnel to assess possible Site-specific matrix effects on instrument performance.

For semi-volatile organics analyses, surrogates will be added to the raw sample to assess extraction efficiency. Internal standards will be added to all sample extracts and instrument calibration standard immediately before analysis for quantitation via internal standardization techniques.

Method-specific QC limits are provided in the attached laboratory method SOPs. Surrogate compound/internal standard recoveries that do not fall within accepted QC limits for the analytical methodology performed will have the analytical results flagged with data qualifiers as appropriate by the laboratory and will not be noted in the laboratory report Case Narrative.

To ascertain the effect non-compliant surrogate compound/internal standard recoveries may have on the reported results, the recovery data will be evaluated as part of the validation process. The Data Validator will provide recommendations for corrective actions, including but not limited to additional data qualification.

7.2.5 Calibration Verification Standards

Calibration verification (CV) standards will be utilized to confirm instrument calibrations and performance throughout the analytical process. CV standards will be prepared as prescribed by the respective analytical protocols. Continuing calibration will be verified by compliance with method-specific criteria prior to additional analysis of project samples.

Non-compliant analysis of CV standards will require immediate corrective action by the project laboratory QA Officer and/or designated personnel. Corrective action may include re-analysis of each affected project sample, a detailed description of the problem, the corrective action undertaken, the person who performed the action, and the resolution of the problem.

7.2.6 Laboratory Method Blank Analyses

Method blank sample analysis will be performed as part of each analytical batch for each methodology. If target compounds are detected in the method blank samples, the reported results will be flagged by the laboratory in accordance with SOPs. The Data Validator will provide recommendations for corrective actions including but not limited to additional data qualification.

8. Data Quality Objectives

Sampling that will be performed as described in the RIWP is designed to produce data of the quality necessary to achieve the minimum standard requirements of the field and laboratory analytical objectives described below. These data are being obtained with the primary objective of assessing levels of contaminants of concern associated with the Site.

The overall project data quality objective (DQO) is to implement procedures for field data collection, sample collection, handling, and laboratory analysis and reporting that achieve the project objectives. The following section is a general discussion of the criteria that will be used to measure the achievement of the project DQO.

8.1 PRECISION

8.1.1 Definition

Precision is defined as a quantitative measure of the degree to which two or more measurements are in agreement. Precision will be determined by collecting and analyzing field duplicate samples and by creating and analyzing laboratory duplicates from one or more of the field samples. The overall precision of measurement data is a mixture of sampling and analytical factors. The analytical results from the field duplicate samples will provide data on sampling precision. The results from duplicate samples created by the laboratory will provide data on analytical precision. The measurement of precision will be stated in terms of RPD.

8.1.2 Field Precision Sample Objectives

Field precision will be assessed through the collection and measurement of field duplicate samples at a rate of one duplicate per 20 investigative samples. The RPD criteria for the project field duplicate samples will be +/- 100 percent for soil and +/- 35 percent for groundwater for parameters of analysis detected at concentrations greater than five times the laboratory RL.

8.1.3 Laboratory Precision Sample Objectives

Laboratory precision will be assessed through the analysis of LCS and laboratory control sample duplicates (LCSD) and MS/MSD samples for groundwater and soil samples, and the analysis of laboratory duplicate samples for air and soil vapor samples. Air and soil vapor laboratory duplicate sample analyses will be performed by analyzing the same Summa canister twice. The RPD criteria for the air/soil vapor laboratory duplicate samples will be +/- 35 percent for parameters of analysis detected at concentrations greater than five times the laboratory RL.

8.2 ACCURACY

8.2.1 Definition

Accuracy relates to the bias in a measurement system. Bias is the difference between the observed and the “true” value. Sources of error are the sampling process, field contamination, preservation techniques, sample handling, sample matrix, sample preparation, and analytical procedure limitations.

8.2.2 Field Accuracy Objectives

Sampling bias will be assessed by evaluating the results of field equipment rinse and trip blanks. Equipment rinse and trip blanks will be collected as appropriate based on sampling and analytical methods for each sampling effort.

If non-dedicated sampling equipment is used, equipment rinse blanks will be collected by passing ASTM Type II water over and/or through the respective sampling equipment utilized during each sampling effort. One equipment rinse blank will be collected for each type of non-dedicated sampling equipment used for the sampling effort. Equipment rinse blanks will be analyzed for each target parameter for the respective sampling effort for which environmental media have been collected.

Note: If dedicated or disposable sampling equipment is used, equipment rinse samples will not be collected as part of that field effort.

Trip blank samples will be prepared by the laboratory and provided with each shipping container, which includes containers for the collection of groundwater samples for the analysis of VOC. Trip blank samples will be analyzed for each VOC for which groundwater samples have been collected for analysis.

8.3 LABORATORY ACCURACY OBJECTIVES

Analytical bias will be assessed through the use of LCS and Site-specific MS sample analyses. LCS analyses will be performed with each analytical batch of project samples to determine the accuracy of the analytical system.

One set of MS/MSD analyses will be performed with each batch of 20 project samples collected for analysis to assess the accuracy of the identification and quantification of analytes within the Site-specific sample matrices. Additional sample volume will be collected at sample locations selected for the preparation of MS/MSD samples so that the standard laboratory RLs are achieved.

The accuracy of analyses that include a sample extraction procedure will be evaluated through the use of system monitoring or surrogate compounds. Surrogate compounds will be added to each sample, standard, blank, and QC sample prior to sample preparation and analysis. Surrogate compound percent recoveries will provide information on the effect of the sample matrix on the accuracy of the analyses.

8.4 REPRESENTATIVENESS

8.4.1 Definition

Representativeness expresses the degree to which sample data represent a characteristic of a population, a parameter variation at a sampling point, or an environmental condition.

Representativeness is a qualitative parameter that is dependent upon the design of the sampling program. The representativeness criterion is satisfied through the proper selection of sampling locations, the quantity of samples, and the use of appropriate procedures to collect and analyze the samples.

8.4.2 Measures to Ensure Representativeness of Field Data

Representativeness will be addressed by prescribing sampling techniques and the rationale used to select sampling locations. Sampling locations may be biased (based on existing data, instrument surveys, observations, etc.) or unbiased (completely random or stratified-random approaches).

8.5 COMPLETENESS

8.5.1 Definition

Completeness is a measure of the amount of valid (usable) data obtained from a measuring system compared to the total amount anticipated to be obtained. The completeness goal for all data uses is that a sufficient amount of valid data be generated so that determinations can be made related to the intended data use with a sufficient degree of confidence.

8.5.2 Field Completeness Objectives

Completeness is a measure of the amount of valid measurements obtained from measurements taken in this project versus the number planned. Field completeness objective for this project will be greater than 90 percent.

8.5.3 Laboratory Completeness Objectives

Laboratory data completeness objective is a measure of the amount of valid data obtained from laboratory measurements. The evaluation of the data completeness will be performed at the conclusion of each sampling and analysis effort.

The completeness of the data generated will be determined by comparing the amount of valid data, based on independent validation, with the total laboratory data set. The completeness goal will be greater than 90 percent.

8.6 COMPARABILITY

8.6.1 Definition

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another.

8.6.2 Measures to Ensure Comparability of Laboratory Data

Comparability of laboratory data will be measured from the analysis of SRMs obtained from either USEPA CRADA suppliers or NIST. The reported analytical data will also be presented in standard units of mass of contaminant within a known volume of environmental media. The standard units for various sample matrices are as follows:

- Solid Matrices – milligrams per kilogram (mg/kg) of media (Dry Weight).
- Aqueous Matrices – nanograms per liter (ng/L) for PFAS analyses, micrograms per liter (µg/L) of media for organic analyses, and milligrams per liter (mg/L) for inorganic analyses.

8.7 LEVEL OF QUALITY CONTROL EFFORT

If non-dedicated sampling equipment is used, equipment rinse blanks will be prepared by field personnel and submitted for analysis of target parameters. Equipment rinse blank samples will be analyzed to check for potential cross-contamination between sampling locations that may be introduced during the investigation. One equipment rinse blank will be collected per sampling event to the extent that non-dedicated sampling equipment is used.

If necessary, a separate equipment rinse blank sample will be collected for PFAS.

Note: If dedicated or disposable sampling equipment is used, equipment rinse samples will not be collected as part of that field effort.

Trip blanks will be used to assess the potential for contamination during sample storage and shipment. Trip blanks will be provided with the sample containers to be used for the collection of groundwater samples for the analysis of VOCs. Trip blanks will be preserved and handled in the same manner as the project samples. One trip blank will be included along with each shipping container containing project samples to be analyzed for VOC.

Method blank samples will be prepared by the laboratory and analyzed concurrently with all project samples to assess potential contamination introduced during the analytical process.

Field duplicate samples will be collected and analyzed to determine sampling and analytical reproducibility. One field duplicate will be collected for every 20 or fewer investigative samples collected for off-site laboratory analysis.

MS will provide information to assess the precision and accuracy of the analysis of the target parameters within the environmental media collected. One MS/MSD will be collected for every 20 or fewer investigative samples per sample matrix.

Note: Soil MS/MSD samples require triple sample volume for VOCs only. Aqueous MS/MSD samples require triple the normal sample volume for VOC analysis and double the volume for the remaining parameters.

9. Data Reduction, Validation, and Reporting

Data generated by the laboratory operation will be reduced and validated prior to reporting in accordance with the following procedures:

9.1 DATA REDUCTION

9.1.1 Field Data Reduction Procedures

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. The pH, conductivity, temperature, turbidity, DO, ORP, and breathing zone VOC readings collected in the field will be generated from direct read instruments. The data will be written into field logbooks immediately after measurements are taken. If errors are made, data will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original entry.

9.1.2 Laboratory Data Reduction Procedures

Laboratory data reduction procedures are provided by the appropriate chapter of USEPA's "Test Methods for Evaluating Solid Waste," SW-846, Third Edition. Errors will be noted; corrections will be made with the original notations crossed out legibly. Analytical results for soil samples will be calculated and reported on a dry weight basis.

9.1.3 Quality Control Data

QC data (e.g., laboratory duplicates, surrogates, MS, and MSD) will be compared to the method acceptance criteria. Data determined to be acceptable will be entered into the laboratory information management system.

Unacceptable data will be appropriately qualified in the project report. Case Narratives will be prepared, which will include information concerning data that fell outside acceptance limits and any other anomalous conditions encountered during sample analysis.

9.2 DATA VALIDATION

Data validation procedures of the analytical data will be performed by the Haley & Aldrich of New York QA Officer or designee using the following documents as guidance for the review process:

- "U.S. EPA National Functional Guidelines for Organic Data Review," and the "U.S. EPA National Functional Guidelines for Inorganic Data Review."
- The specific data qualifiers used will be applied to the reported results as presented and defined in the USEPA National Functional Guidelines. Validation will be performed by qualified personnel at the direction of the Haley & Aldrich of New York QA Officer.
- The completeness of each data package will be evaluated by the Data Validator. Completeness checks will be administered on all data to determine that the deliverables are consistent with the NYSDEC Analytical Services Protocol (ASP) Category A and Category B data package

requirements. The validator will determine whether the required items are present and request copies of missing deliverables (if necessary) from the laboratory.

9.3 DATA REPORTING

Data reporting procedures will be carried out for field and laboratory operations as indicated below:

- **Field Data Reporting:** Field data reporting will be conducted principally through the transmission of report sheets containing tabulated results of measurements made in the field and documentation of field calibration activities.
- **Laboratory Data Reporting:** The laboratory data reporting package will enable data validation based on the protocols described above. The final laboratory data report format will include the QA/QC sample analysis deliverables to enable the development of a DUSR based on NYSDEC DER-10 Appendix 2B.

10. Performance and System Audits

A performance audit is an independent quantitative comparison with data routinely obtained in the field or the laboratory. Performance audits include two separate, independent parts: internal and external audits.

10.1 FIELD PERFORMANCE AND SYSTEM AUDITS

10.1.1 Internal Field Audit Responsibilities

Internal audits of field activities will be initiated at the discretion of the Project Manager and will include the review of sampling and field measurements. The audits will verify that all procedures are being followed. Internal field audits will be conducted periodically during the project. The audits will include examination of the following:

- Field sampling records, screening results, and instrument operating records;
- Sample collection;
- Handling and packaging in compliance with procedures;
- Maintenance of QA procedures; and
- Chain-of-custody reports.

10.1.2 External Field Audit Responsibilities

External audits may be conducted by the Project Coordinator at any time during the field operations. These audits may or may not be announced and are at the discretion of the NYSDEC. The external field audits can include (but are not limited to) the following:

- Sampling equipment decontamination procedures;
- Sample bottle preparation procedures;
- Sampling procedures;
- Examination of HASPs;
- Procedures for verification of field duplicates; and/or
- Field screening practices.

10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS

10.2.1 Internal Laboratory Audit Responsibilities

The laboratory system audits are typically conducted by the Laboratory QA Officer or designee on an annual basis. The system audit will include an examination of laboratory documentation, including sample receiving logs, sample storage, chain-of-custody procedures, sample preparation and analysis, and instrument operating records.

At the conclusion of internal system audits, reports will be provided to the laboratory's operating divisions for appropriate comment and remedial/corrective action where necessary. Records of audits and corrective actions will be maintained by the Laboratory QA Officer.

10.2.2 External Laboratory Audit Responsibilities

External audits will be conducted, as required, by the NYSDOH or designee. External audits may include any of the following:

- Review of laboratory analytical procedures;
- Laboratory on-site visits; and/or
- Submission of performance evaluation samples for analysis

Failure of any of the above audit procedures can lead to laboratory de-certification. An audit may consist of, but is not limited to:

- Sample receipt procedures;
- Custody, sample security, and log-in procedures;
- Review of instrument calibration logs;
- Review of QA procedures;
- Review of log books;
- Review of analytical SOPs; and/or
- Personnel interviews.

A review of a data package from samples recently analyzed by the laboratory can include (but not be limited to) the following:

- Comparison of resulting data to the SOP or Method;
- Verification of initial and continuing calibrations within control limits;
- Verification of surrogate recoveries and instrument timing results;
- Review of extended quantitation reports for comparisons of library spectra to instrument spectra, where applicable; and/or
- Assurance that samples are run within holding times.

11. Preventive Maintenance

11.1 FIELD INSTRUMENT PREVENTIVE MAINTENANCE

The field equipment preventive maintenance program is designed to ensure the effective completion of the sampling effort and to minimize equipment downtime. Program implementation is concentrated in three areas:

- Maintenance responsibilities;
- Maintenance schedules; and
- Inventory of critical spare parts and equipment.

The maintenance responsibilities for field equipment will be assigned to the task leaders in charge of specific field operations. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. In addition, the field personnel will be responsible for determining that an inventory of spare parts will be maintained with the field equipment. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes, and/or cannot be obtained in a timely manner.

11.2 LABORATORY INSTRUMENT PREVENTIVE MAINTENANCE

Analytical instruments at the laboratory will undergo routine and/or preventive maintenance. The extent of the preventive maintenance will be a function of the complexity of the equipment.

Generally, annual preventive maintenance service will involve cleaning, adjusting, inspecting, and testing procedures designed to reduce instrument failure and/or extend useful instrument life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications by laboratory personnel.

12. Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

12.1 FIELD MEASUREMENTS

Field-generated information will be reviewed by the Field Coordinator and typically includes evaluation of bound logbooks/forms, data entry, and calculation checks. Field data will be assessed by the Project Coordinator, who will review the field results for compliance with the established QC criteria that are specified in Section 7.0 of this QAPP. The accuracy of pH and specific conductance will be assessed using daily instrument calibration, calibration check, and blank data. Accuracy will be measured by determining the percent recovery (% R) of calibration check standards. Precision of the pH and specific conductance measurements will be assessed on the basis of the reproducibility of duplicate readings of a field sample and will be measured by determining the RPD. Accuracy and precision of the soil VOC screening will be determined using duplicate readings of calibration checks. Field data completeness will be calculated using the following equation:

$$\text{Completeness} = \frac{\text{Valid (usable) Data Obtained}}{\text{Total Data Planned}} \times 100$$

12.2 LABORATORY DATA

Surrogate, internal standard, and MS recoveries will be used to evaluate data quality. The laboratory QA/QC program will include the following elements:

- Precision, in terms of RPD, will be determined by relative sample analysis at a frequency of one duplicate analysis for each batch of ten project samples or a frequency of 10 percent. RPD is defined as the absolute difference of duplicate measurements divided by the mean of these analyses, normalized to a percentage.
- Accuracy, in terms of percent recovery (recovery of known constituent additions or surrogate recoveries), will be determined by the analysis of spiked and unspiked samples. MS/MSD will be used to determine analytical accuracy. The frequency of MS/MSD analyses will be one project sample MS/MSD per set of 20 project samples.
- One method blank will be prepared and analyzed with each batch of project samples. The total number of method blank sample analyses will be determined by the laboratory analytical batch size.
- SRMs will be used for each analysis. Sources of SRMs include the USEPA, commercially available material from CRADA-certified vendors, and/or laboratory-produced solutions. SRMs, when available and appropriate, will be processed and analyzed on a frequency of one per set of samples.
- Completeness is the evaluation of the amount of valid data generated versus the total set of data produced from a particular sampling and analysis event. Valid data is determined by independent confirmation of compliance with method-specific and project-specific DQOs. The calculation of data set completeness will be performed by the following equation.

$$\frac{\text{Number of Valid Sample Results}}{\text{Total Number of Samples Planned}} \times 100 = \% \text{ Complete}$$

13. Quality Assurance Reports

Critically important to the successful implementation of the QAPP is a reporting system that provides the means by which the program can be reviewed, problems identified, and programmatic changes made to improve the plan.

QA reports to management can include:

- Audit reports: internal and external audits with responses
- Performance evaluation sample results: internal and external sources
- Daily QA/QC exception reports/corrective actions

QA/QC corrective action reports will be prepared by the Haley & Aldrich of New York QA Officer when appropriate and presented to the project and/or laboratory management personnel so that performance criteria can be monitored for all analyses from each analytical department. The updated trend/QA charts prepared by the laboratory QA personnel will be distributed and reviewed by various levels of the laboratory management.

References

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TABLE

TABLE I
SUMMARY OF ANALYSIS METHOD, PRESERVATION METHOD, HOLDING TIME, SAMPLE SIZE REQUIREMENTS AND SAMPLE CONTAINERS
FORMER TILSDALE LUMBER AND COAL REDEVELOPMENT SITE
8-01 AND 8-51 26TH AVENUE
QUEENS, NEW YORK

Analysis/Method	Sample Type	Preservation	Holding Time	Volume/Weight	Container
Volatile Organic Compounds/8260C	Soil	1 - 1 Vial MeOH/2 Vial Water, Cool, 4 ± 2 °C	14 days ¹	120 mL	3 - 40ml glass vials
Semivolatile Organic Compounds/8270D	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Metals/6010C	Soil	Cool, 4 ± 2 °C	180 days	60 mL	1 - 2 oz Glass
Polychlorinated Biphenyls/8082A	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Pesticides (8081B)	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
PFAS 1633	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
1,4-Dioxane 8270	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Volatile Organic Compounds/8260B	Groundwater	HCl, Cool, 4 ± 2 °C	14 days	120 mL	3 - 40ml glass vials
Semivolatile Organic Compounds/8270C	Groundwater	Cool, 4 ± 2 °C	7 days	500 mL	2 - 250 mL amber glass
TAL Metals 6010/7471	Groundwater	HNO ₃ Cool, 4 ± 2 °C	180 days	500 mL	1 - 500 mL plastic bottle
Polychlorinated Biphenyls/8082	Groundwater	Cool, 4 ± 2 °C	365 days	2000 mL	2 - 1000 mL amber glass
Pesticides (8081B)	Groundwater	Cool, 4 ± 2 °C	7 days	1000 mL	2 - 500 mL amber glass
PFAS 1633	Groundwater	H2O Cool, 4 ± 2 °C	14 days	500 mL	2 - Teflon free 250 ml plastic containers
1,4-Dioxane 8270D	Groundwater	Cool, 4 ± 2 °C	7 days	500 mL	1 - 500 mL plastic bottle
Volatile Organic Compounds/TO-15	Soil Vapor	N/A	30 days	2.7 - 6 L	1 2.7 or 6 L Summa Canister

Notes:
1. Terracores and encores must be frozen within 48 hours of collection
2. Refer to text for additional information.

APPENDIX D
NYSDEC Emerging Contaminant
Field Sampling Guidance



Department of
Environmental
Conservation

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

Under NYSDEC's Part 375 Remedial Programs

April 2023



Table of Contents

Objective	1
Applicability	1
Field Sampling Procedures.....	1
Analysis and Reporting.....	2
Routine Analysis	2
Additional Analysis	2
Data Assessment and Application to Site Cleanup	3
Water Sample Results	3
Soil Sample Results	3
Testing for Imported Soil.....	4
Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS	5
Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids.....	6
Appendix C - Sampling Protocols for PFAS in Monitoring Wells	8
Appendix D - Sampling Protocols for PFAS in Surface Water.....	10
Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells.....	12
Appendix F - Sampling Protocols for PFAS in Fish	14
Appendix G - PFAS Analyte List	22
Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids.....	24

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
Data Assessment and Application to Site Cleanup Page 3	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	3/28/2023
Water Sample Results Page 3	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.	NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These guidance values also include criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.	3/28/2023
Soil Sample Results Page 3	Soil cleanup objectives for PFOA and PFOS have been 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:	NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:	3/28/2023
Protection of Groundwater Page 3	PFOA (ppb) 1.1 PFOS (ppb) 3.7	PFOA (ppb) 0.8 PFOS (ppb) 1.0	3/28/2023

Citation and Page Number	Current Text	Corrected Text	Date
Footnote 2 Page 3	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).	The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). 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).	3/28/2023
Testing for Imported Soil Page 4	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.	If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.	3/28/2023
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

Citation and Page Number	Current Text	Corrected Text	Date
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
Water Sample Results Page 10	<p>PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water (...)</p> <p>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.</p>	<p>PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water (...)</p> <p>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.</p>	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Soil Sample Results, page 10	<p>“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.”</p>	<p>“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. “</p> <p>[Interim SCO Table]</p> <p>“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.</p> <p>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:</p> <p>https://www.nj.gov/dep/srp/guidance/rs/daf.pdf. ”</p>	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Testing for Imported Soil Page 11	<p>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.</p> <p>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.</p>	<p>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.</p> <p>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.</p>	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
Water Sample Results Page 9	<p>“In addition, further assessment of water may be warranted if either of the following screening levels are met:</p> <p>a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or</p> <p>b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L”</p>	Deleted	6/15/2021

Citation and Page Number	Current Text	Corrected Text	Date
Routine Analysis, Page XX	Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP)... 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).	Deleted	5/31/2022
Analysis and Reporting, Page XX	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.	Deleted	5/31/2022
Routine Analysis, Page XX	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.	EPA Method 1633 is the procedure to use for environmental samples.	
Soil Sample Results, Page XX	Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6	Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6	
Appendix A	"Include in the text... LC-MS/MS for PFAS using methodologies based on EPA Method 537.1"	"Include in the textEPA Method 1633"	
Appendix A	"Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101"	Deleted	
Appendix B	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	

Citation and Page Number	Current Text	Corrected Text	Date
Appendix C	“Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1”	“Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633”	
Appendix D	“Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1”	“Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633”	
Appendix G		Updated to include all forty PFAS analytes in EPA Method 533	
Appendix H		Deleted	
Appendix I	Appendix I	Appendix H	
Appendix H	“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.”	“These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER).”	
Appendix H	“The holding time is 14 days...”	“The holding time is 28 days...”	
Appendix H, Initial Calibration	“The initial calibration should contain a minimum of five standards for linear fit...”	“The initial calibration should contain a minimum of six standards for linear fit...”	
Appendix H, Initial Calibration	Linear fit calibration curves should have an R ² value greater than 0.990.	Deleted	
Appendix H, Initial Calibration Verification	Initial Calibration Verification Section	Deleted	
Appendix H	secondary Ion Monitoring Section	Deleted	
Appendix H	Branched and Linear Isomers Section	Deleted	

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

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 G) 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

EPA Method 1633 is the procedure to use for environmental samples. 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. 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).

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

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.

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 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

NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These human health criteria should also be applied to surface water that is used as a water supply. This guidance also includes criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.

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

NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. 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	0.8	1.0

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

² The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). 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).

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 the ambient water quality guidance values for groundwater, 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 EPA Method 1633
- 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
-
- 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 EPA Method 1633.

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 $4 \pm 2^\circ$ 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 EPA Method 1633.

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 $4 \pm 2^\circ$ 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 EPA Method 1633.

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 $4 \pm 2^\circ$ 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 $4 \pm 2^\circ$ 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 current SOP developed by the Division of Fish and Wildlife (DFW) entitled “General Fish Handling Procedures for Contaminant Analysis” (Ver. 8). This SOP should be followed when collecting fish for contaminant analysis. Note, however, that the Bureau of Ecosystem Health will not be supplying bags or tags. All supplies are the responsibility of the collector

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 $<45^{\circ}\text{F}$ ($<8^{\circ}\text{C}$) immediately following data processing. As soon as possible, freeze at $-20^{\circ}\text{C} \pm 5^{\circ}\text{C}$. 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

page _____ of _____

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	

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 envelopes, 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 sulfonic acids	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluoropentanesulfonic acid	PFPeS	2706-91-4
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorononanesulfonic acid	PFNS	68259-12-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
	Perfluorododecanesulfonic acid	PFDoS	79780-39-5
Perfluoroalkyl carboxylic acids	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	PFUnA	2058-94-8
	Perfluorododecanoic acid	PFDaA	307-55-1
	Perfluorotridecanoic acid	PFTTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTeDA	376-06-7
Per- and Polyfluoroether carboxylic acids	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
	4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
Fluorotelomer sulfonic acids	4:2 Fluorotelomer sulfonic acid	4:2-FTS	757124-72-4
	6:2 Fluorotelomer sulfonic acid	6:2-FTS	27619-97-2
	8:2 Fluorotelomer sulfonic acid	8:2-FTS	39108-34-4
Fluorotelomer carboxylic acids	3:3 Fluorotelomer carboxylic acid	3:3 FTCA	356-02-5
	5:3 Fluorotelomer carboxylic acid	5:3 FTCA	914637-49-3
	7:3 Fluorotelomer carboxylic acid	7:3 FTCA	812-70-4
Perfluorooctane sulfonamides	Perfluorooctane sulfonamide	PFOSA	754-91-6
	N-methylperfluorooctane sulfonamide	NMeFOSA	31506-32-8
	N-ethylperfluorooctane sulfonamide	NEtFOSA	4151-50-2
Perfluorooctane sulfonamidoacetic acids	N-methylperfluorooctane sulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethylperfluorooctane sulfonamidoacetic acid	N-EtFOSAA	2991-50-6
Perfluorooctane sulfonamide ethanols	N-methylperfluorooctane sulfonamidoethanol	MeFOSE	24448-09-7
	N-ethylperfluorooctane sulfonamidoethanol	EtFOSE	1691-99-2

Group	Chemical Name	Abbreviation	CAS Number
Ether sulfonic acids	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major)	9Cl-PF3ONS	756426-58-1
	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	11Cl-PF3OUdS	763051-92-9
	Perfluoro(2-ethoxyethane) sulfonic acid	PFEESA	113507-82-7

Appendix H - 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 using EPA Method 1633 for projects within the Division of Environmental Remediation (DER). 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 28 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 6°C 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 six 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%.

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
-----------	-----------------------------------

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

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.

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.

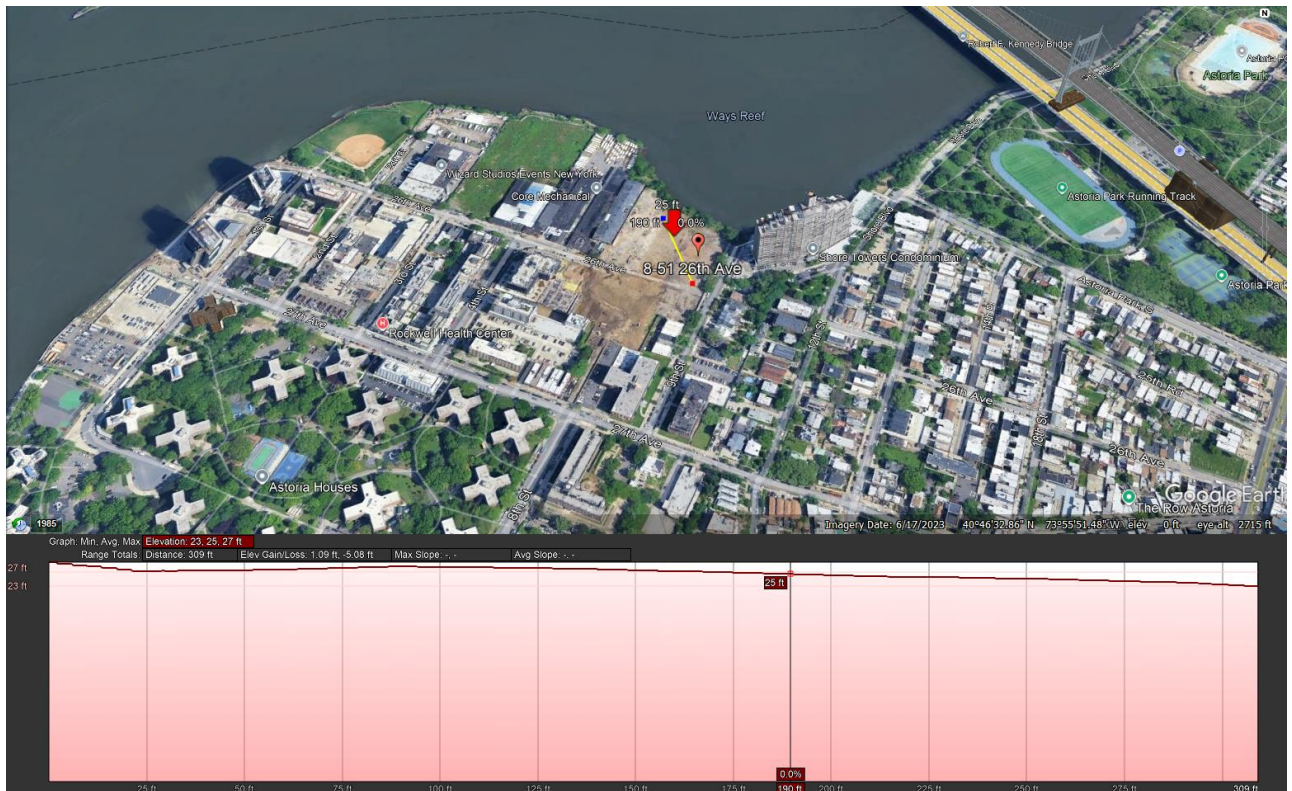
APPENDIX E

Climate Screening Checklist

Climate Screening Checklist

Background Information

- Project Manager: Emily Butler
- Site Name: Former Tiltsdale Lumber and Coal Redevelopment Site
- Site Number: C241295
- Site Location: 8-01 and 8-51 26th Avenue, Queens, New York
- Site Elevation (average above sea level): Approximately 25 feet above sea level (Google Earth)



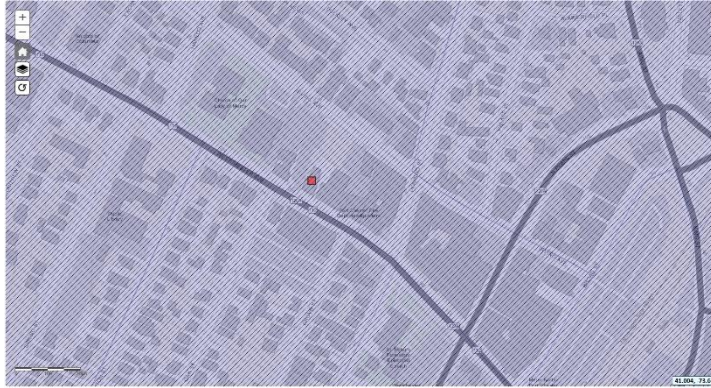
- ClimAID Region ([Responding Climate Change in New York State \(ClimAID\) - NYSERDA](#)): Region 4 – New York City and Long Island



- Remedial Stage/Site Classification: Investigation.
- Contamination - Media Impacted/ Contaminants of Concern:
 - volatile organic compounds (VOCs), specifically chlorinated volatile organic compounds (CVOCs); semi-volatile organic compounds (SVOCs), specifically polycyclic aromatic hydrocarbons (PAHs); metals, including lead, mercury, and trivalent chromium; pesticides; polychlorinated biphenyls (PCBs); and per- and polyfluoroalkyl substances (PFAS) in soil;
 - CVOCs, SVOCs, PCBs, and PFAS in groundwater; and
 - CVOCs in soil vapor.
- Proposed/Current Remedy: The remedy will be proposed upon the completion of the pending Remedial Investigation (RI), when the extent of environmental impacts at the Site is determined.
- What is the predicted timeframe of the remedy? Will components of the remedy still be in place in 10+ years? The predicted timeframe is unknown as environmental impacts at the Site are undetermined.
- Is the site in proximity to any sensitive receptors? (e.g., wetlands, waterbodies, residential properties, hospitals, schools, drinking water supplies, etc.) Ways Reef is located immediately to the north of the Site.

Is the site in a disadvantaged community (DAC) or potential environmental justice area (PEJA) (Use DECinfoLocator: [DECinfo Locator \(ny.gov\)](https://decinfo.locator.ny.gov/))?

☒ Yes ☐ No



If the site is in a DAC or PEJA, will climate impacts be magnified? If yes, list how and why.

☐ Yes ☒ No

Should thresholds of concern be lowered to account for magnification of impacts? If yes, indicate how lower thresholds will be used in the screening.

☐ Yes ☒ No

Climate Screening Table*

Potential Climate Hazards	Relevant to the Site Location (Y/N/NA) ¹	Projected Change (Resilience Analysis and Planning Tool (RAPT)/arccgis.com ³	Potential to Impact Remedy (Y/N)	Is remedy/site already resilient? (Y/N) ⁴
Precipitation	N	N/A	N/A	N/A
Temperature ² (Extreme Heat or Cold Weather Impacts)	N	N/A	N/A	N/A
Sea Level Rise	N	N/A	N/A	N/A
Flooding	N	N/A	N/A	N/A
Storm Surge	N	N/A	N/A	N/A
Wildfire	N	N/A	N/A	N/A
Drought	N	N/A	N/A	N/A
Storm Severity	N	N/A	N/A	N/A
Landslides	N	N/A	N/A	N/A
Other Hazards:	N/A	N/A	N/A	N/A

* Links to potential data sources can be found on the following page

¹ If the first column is N --> The rest of the columns will be N/A, the hazard is not applicable to the site.

² Extreme Heat: periods of three or more days above 90°F- Extreme Cold: Individual days with minimum temperatures at or below 0 degrees F (NYSERDA ClimAID report)

³ List the projected change in specific terms or units e.g. inches of rainfall, feet of sea level rise, etc.

⁴ If final column is Y, provide reasoning, if the final column is N --> Climate Vulnerability Assessment (CVA) required.

Required Next Steps (If no further action is required, provide justification):

Conduct severe weather storm inspections during the active remedy. Inspect dewatering systems prior to anticipated storm events that could result in a power outage, and after storm events.

Potential Data Sources (not an exhaustive list)- from [Superfund Climate Resilience: Vulnerability Assessment | US EPA](#)

NYSERDA ClimAID report- [Responding Climate Change in New York State \(ClimAID\) - NYSERDA](#)

FEMA- [National Flood Hazard Layer | FEMA.gov](#)

NOAA- [National Storm Surge Risk Maps - Version 3 \(noaa.gov\)](#)

Department of Agriculture Forest Service [Wildfire Risk to Communities](#)

EPA [Climate Change Indicators in the United States](#)

EPA [Climate Resilience Evaluation & Awareness Tool \(CREAT\) | U.S. Climate Resilience Toolkit](#)

EPA [National Stormwater Calculator](#)

National Integrated Drought Information System [U.S. Drought Portal](#)

National Interagency Coordination Center [National Interagency Fire Center](#)

National Oceanic and Atmospheric Administration Coastal Services [Digital Coast](#)

- Resources to help communities assess coastal hazards, such as the [Sea Level Rise Viewer](#) for visualizing community-level impacts of flooding or sea level rise and [downloadable LIDAR data](#)

National Oceanic and Atmospheric Administration [National Centers for Environmental Information](#) website

National Oceanic and Atmospheric Administration [Sea Level Trends](#)

National Weather Service [Climate Prediction Center](#)

National Weather Service [National Hurricane Center](#)

National Weather Service [Sea, Lake, and Overland Surges from Hurricanes \(SLOSH\)](#)

National Weather Service [Storm Surge Hazard Maps](#)

U.S. Federal Government Climate Resilience Toolkit: [The Climate Explorer](#)

U.S. Army Corps of Engineers [Climate Preparedness and Resilience](#)

U.S. Geological Survey [Coastal Change Hazards Portal](#)

U.S. Geological Survey [Landslide Hazards Program](#)

U.S. Geological Survey [National Ground-water Monitoring Network Data Portal](#)

U.S. Geological Survey [National Climate Change Viewer](#)

U.S. Geological Survey [National Water Dashboard](#)

U.S. Geological Survey [StreamStats](#)

NYS Department of State- [Assess | Department of State \(ny.gov\)](#)

NYSERDA NY Coastal Floodplain Mapper- [Home Page \(ny.gov\)](#)

NYSDEC Coastal Erosion Hazards- [Coastal Areas Regulated By The CEHA Permit Program - NYDEC](#)

NYSDOH Heat Index- [health.ny.gov/environmental/weather/vulnerability_index/county_maps.htm](#)

APPENDIX F
Green Sustainable Remediation Documentation



H & A OF NEW YORK ENGINEERING
AND GEOLOGY, LLP
213 W. 35th Street
7th Floor
New York, NY 10001
646.277.5685

December 3, 2025
File No. 0211417-001

New York State Department of Environmental Conservation
Region 2 – Division of Environmental Remediation
47-40 21st Street
Long Island City, New York 11101-5401

Subject: Remedial Investigation Work Plan
Former Tilsdale Lumber and Coal Redevelopment Site
8-01 and 8-51 26th Avenue
Queens, New York
BCP Site C241295

H & A of New York Engineering and Geology, LLP (Haley & Aldrich of New York) presents the following environmental footprint analysis in accordance with U.S. Environmental Protection Agency (USEPA) 542-R-12-002 for the proposed Remedial Investigation (RI) of the above-referenced site located at 8-01 and 8-51 26th Avenue, Queens, New York (Site).

FORMER NEW CITY LINK AUTO REPAIR SITE – INVESTIGATION

The RI is anticipated to result in estimated totals of:

- 1,176.22 metric million British thermal units (MMBtus) of energy used;
- 88.94 tons of total greenhouse gas emissions (CO₂e);
- 4471.77 pounds (lbs) of NO_x + SO_x + PM emissions; and,
- 33.85 lbs of Hazardous Air Pollutants (HAP) emissions.

Energy

- 9.02 MMBtus used for on-site activities, such as well development and sampling.
- 0.02 MMBtus used for Grid Electricity Generation.
- 21.95 MMBtus used for transportation of personnel and investigation materials.
- 1,145.23 MMBtus used for off-site activities.

Greenhouse Gas Emissions (CO₂e)

- 0.66 tons of CO₂e produced from on-site activities, such as drilling.
- 0.00 tons of CO₂e produced from Grid Electricity Generation.
- 1.60 tons of CO₂e produced from transportation of contractors, personnel, and investigation materials.
- 78.42 tons of CO₂e produced from off-site activities.

Water Usage

- 137 gallons of water are estimated to be used during the investigation.

Overall, the estimated environmental footprint of the RI is dominated by off-site activities (which include diesel fuel production). Transportation of materials and personnel is the next largest contributor to the environmental footprint of the RI, which is anticipated to generate 3,528 lbs of CO₂e and use 22 MMbtus of energy. Off-site energy use is anticipated to comprise 97.37 percent of all energy use and off-site greenhouse gas emissions to comprise 97.2 percent of all emissions for the investigation.

Sincerely yours,

H & A OF NEW YORK ENGINEERING AND GEOLOGY, LLP

Environmental Footprint Summary

Core Element	Metric		Unit of Measure	Footprint						
				Proposed Remedial Investigation						Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	2.3	0.0	0.0	0.0	0.0	0.0	2.3
	M&W-2	% of refined materials from recycled or reused material	%	0.0%						0.0%
	M&W-3	Unrefined materials used on-site	Tons	0.000	0.000	0.000	0.000	0.000	0.000	0.0
	M&W-4	% of unrefined materials from recycled or reused material	%							
	M&W-5	On-site hazardous waste disposed of off-site	Tons	6,050.0	0.0	0.0	0.0	0.0	0.0	6,050.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%	0.0%						0.0%
Water (used on-site)	W-1	Public water use	MG	0.0001	0.0	0.0	0.0	0.0	0.0	0.0001
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	1,176.2	0.0	0.0	0.0	0.0	0.0	1,176.2
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.003	0.000	0.000	0.000	0.000	0.000	0.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	11.6	0.0	0.0	0.0	0.0	0.0	11.6
	A-2	On-site HAP emissions	Pounds	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	A-3	Total NOx, SOx, and PM emissions	Pounds	4,471.8	0.0	0.0	0.0	0.0	0.0	4,471.8
	A-3A	Total NOx emissions	Pounds	1,055.5	0.0	0.0	0.0	0.0	0.0	1,055.5
	A-3B	Total SOx emissions	Pounds	720.1	0.0	0.0	0.0	0.0	0.0	720.1
	A-3C	Total PM emissions	Pounds	2,696.1	0.0	0.0	0.0	0.0	0.0	2,696.1
	A-4	Total HAP emissions	Pounds	33.9	0.0	0.0	0.0	0.0	0.0	33.9
	A-5	Total greenhouse gas emissions	Tons CO2e*	88.9	0.0	0.0	0.0	0.0	0.0	88.9
Land & Ecosystems		Qualitative Description								

* Total greenhouse gases emissions (in CO2e) include consideration of CO2, CH4, and N2O (Nitrous oxide) emissions.

"MMBtu" = millions of Btus

"MG" = millions of gallons

"CO2e" = carbon dioxide equivalents of global warming potential

"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)

"Tons" = short tons (2,000 pounds)

The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

Notes:

All - Energy & Air Compiled Results

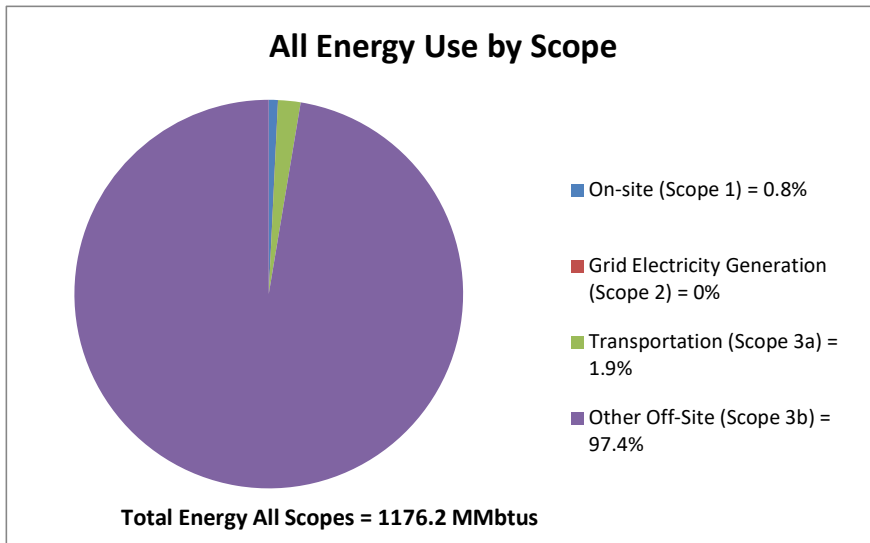
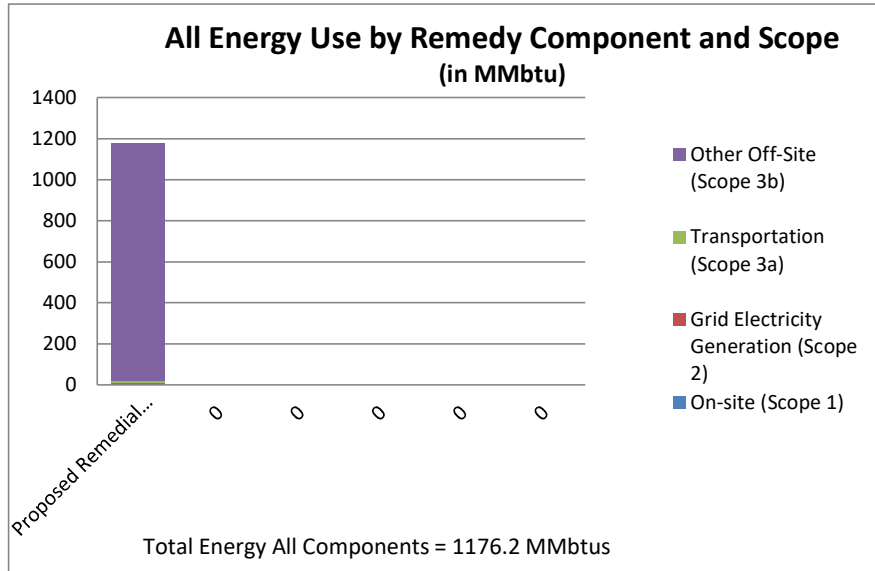
Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	9	1,458	11	0	0	12	0
Grid Electricity Generation (Scope 2)	0.019	3	0	0	0	0	0
Transportation (Scope 3a)	22	3,528	16	0	1	17	1
Other Off-Site (Scope 3b)	1,145	172,894	1,028	719	2,695	4,443	33
Remedy Totals	1,176	177,882	1,056	720	2,696	4,472	34

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity
On-site renewable energy generation or use	MMBtu	0
On-site biodiesel use	MMBtu	0
Biodiesel and other renewable resource use for transportation	MMBtu	0
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0
Voluntary purchase of renewable electricity	MWh	0
Voluntary purchase of RECs	MWh	0

(This value is the sum of the three rows above)

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file:
SEFA_calculations_(121718).xlsx



Total Energy MMbtus							
	Proposed f	0	0	0	0	0 Total	
On-site (Scope 1)	9.0	0.0	0.0	0.0	0.0	0.0	9.0
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 Electricity
Transportation (Scope 3a)	22.0	0.0	0.0	0.0	0.0	0.0	22.0 Tran
Other Off-Site (Scope 3b)	1,145.2	0.0	0.0	0.0	0.0	0.0	1,145.2 Oth
Total	1,176.2	0.0	0.0	0.0	0.0	0.0	1,176.2

Proposed Remedial Investigation = 100%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

On-site (Scope 1) = 0.8%

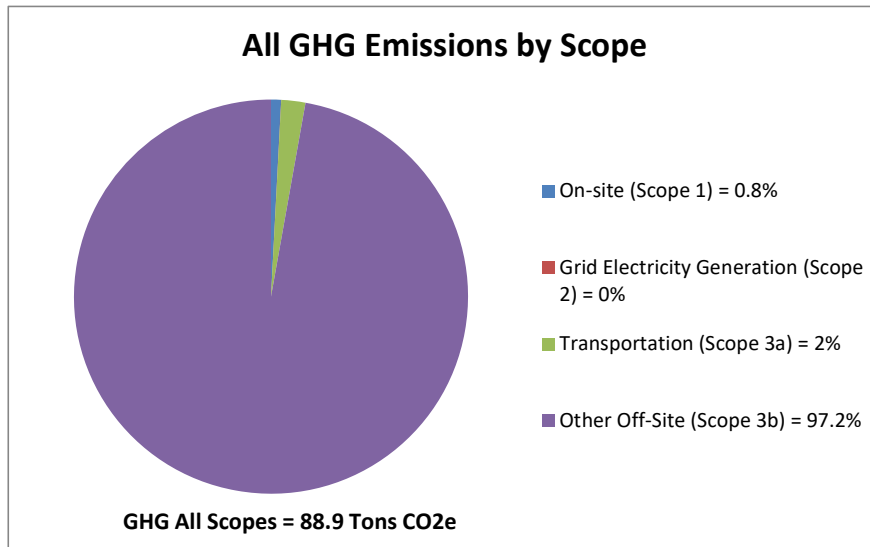
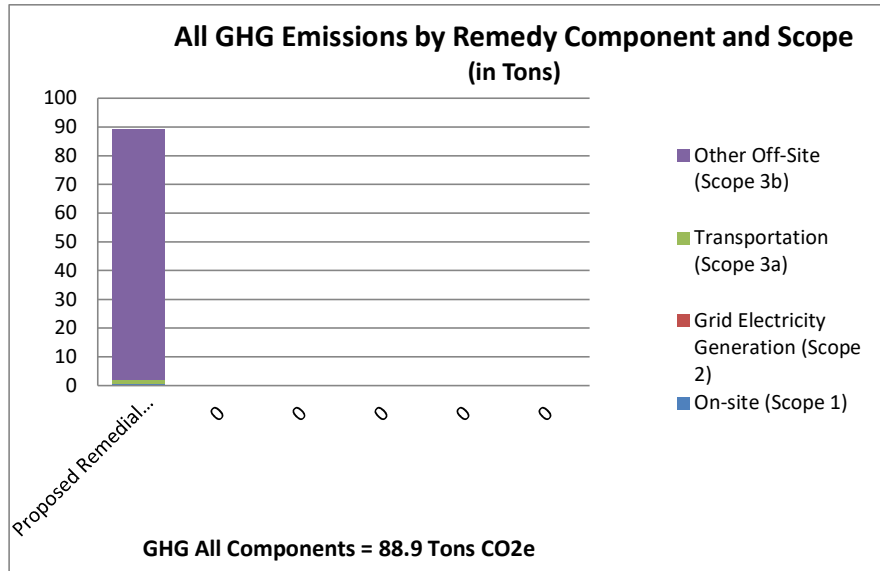
Grid Electricity Generation (Scope 2) = 0%

Transportation (Scope 3a) = 1.9%

Other Off-Site (Scope 3b) = 97.4%

Total Energy All Components = 1176.2 MMBtus

Total Energy All Scopes = 1176.2 MMBtus



GHG Tons CO2e							
	Proposed f	0	0	0	0	0 Total	
On-site (Scope 1)	0.7	0.0	0.0	0.0	0.0	0.0	0.7
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation (Scope 3a)	1.8	0.0	0.0	0.0	0.0	0.0	1.8
Other Off-Site (Scope 3b)	86.4	0.0	0.0	0.0	0.0	0.0	86.4
Total	88.9	0.0	0.0	0.0	0.0	0.0	88.9

Proposed Remedial Investigation = 100%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

On-site (Scope 1) = 0.8%

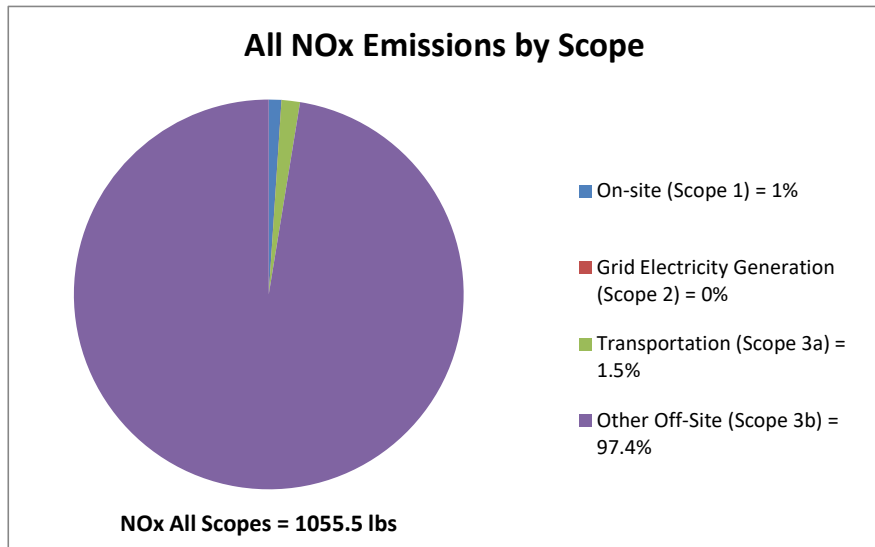
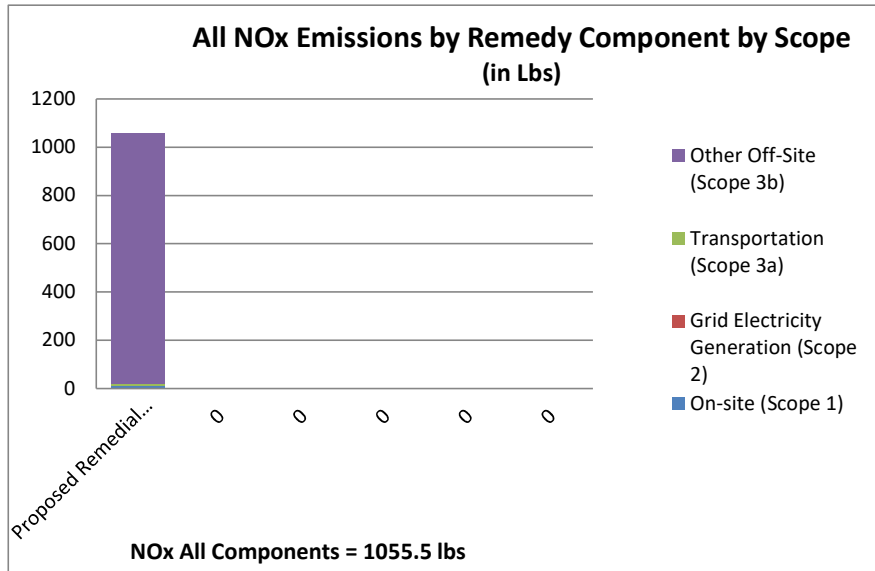
Grid Electricity Generation (Scope 2) = 0%

Transportation (Scope 3a) = 2%

Other Off-Site (Scope 3b) = 97.2%

GHG All Components = 88.9 Tons CO2e

GHG All Scopes = 88.9 Tons CO2e



NOx lbs		Proposed f	0	0	0	0	0 Total	
On-site (Scope 1)	11.0	0.0	0.0	0.0	0.0	0.0	11.0	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Grid Electricity
Transportation (Scope 3a)	16.0	0.0	0.0	0.0	0.0	0.0	16.0	Tran
Other Off-Site (Scope 3b)	1,028.5	0.0	0.0	0.0	0.0	0.0	1,028.5	Oth
Total	1,055.5	0.0	0.0	0.0	0.0	0.0	1,055.5	

Proposed Remedial Investigation = 100%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

On-site (Scope 1) = 1%

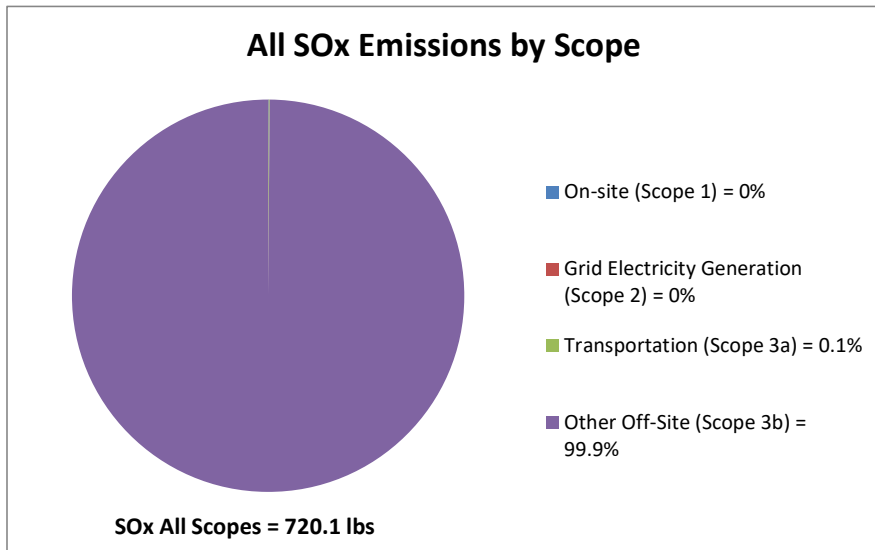
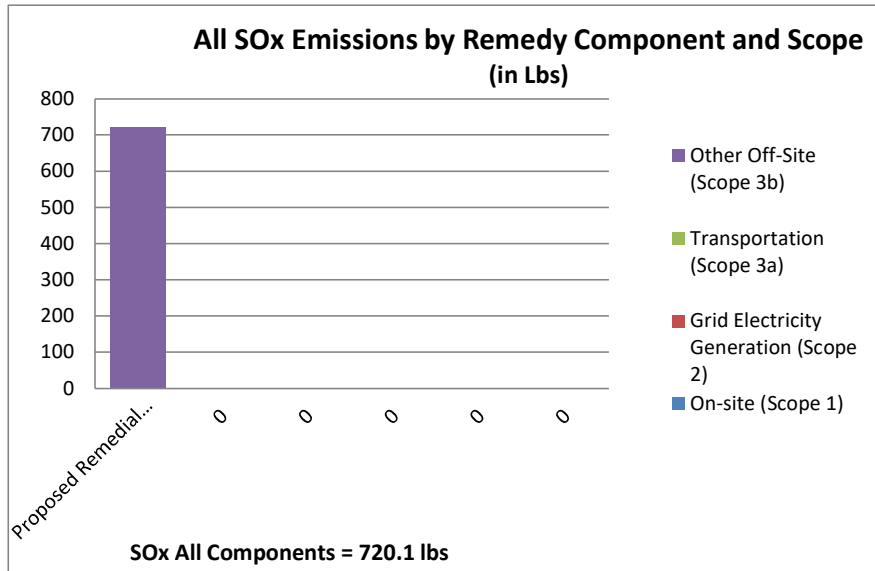
Grid Electricity Generation (Scope 2) = 0%

Transportation (Scope 3a) = 1.5%

Other Off-Site (Scope 3b) = 97.4%

NOx All Components = 1055.5 lbs

NOx All Scopes = 1055.5 lbs



SOx lbs		Proposed f	0	0	0	0	0 Total	
On-site (Scope 1)	0.3	0.0	0.0	0.0	0.0	0.0	0.3	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Grid Electricity
Transportation (Scope 3a)	0.5	0.0	0.0	0.0	0.0	0.0	0.5	Tran
Other Off-Site (Scope 3b)	719.3	0.0	0.0	0.0	0.0	0.0	719.3	Oth
Total	720.1	0.0	0.0	0.0	0.0	0.0	720.1	

Proposed Remedial Investigation = 100%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

On-site (Scope 1) = 0%

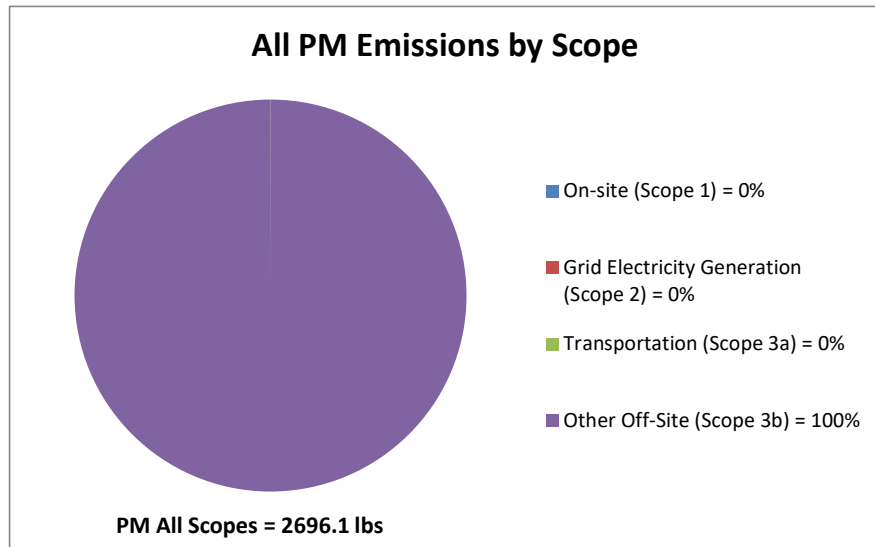
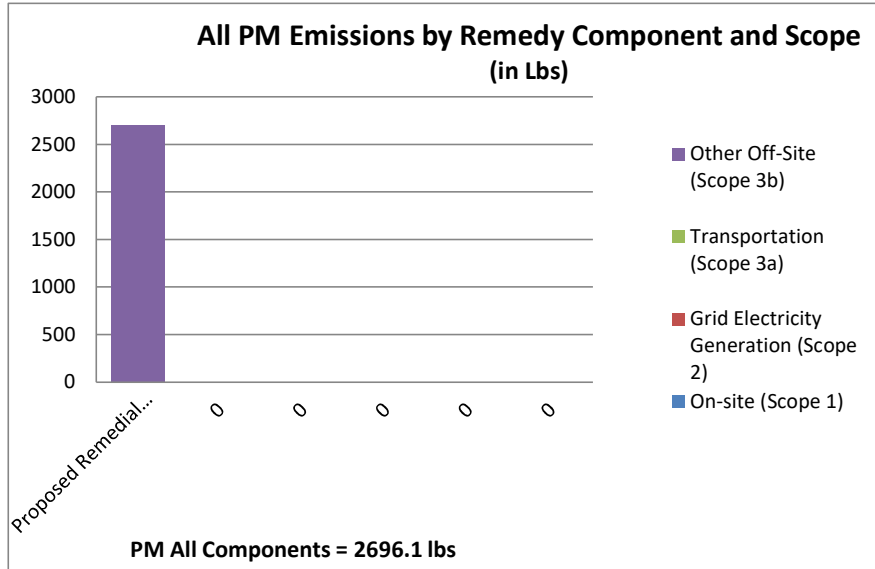
Grid Electricity Generation (Scope 2) = 0%

Transportation (Scope 3a) = 0.1%

Other Off-Site (Scope 3b) = 99.9%

SOx All Components = 720.1 lbs

SOx All Scopes = 720.1 lbs



PM lbs		Proposed f	0	0	0	0	0 Total	
On-site (Scope 1)	0.2	0.0	0.0	0.0	0.0	0.0	0.2	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Grid Electricity
Transportation (Scope 3a)	0.5	0.0	0.0	0.0	0.0	0.0	0.5	Tran
Other Off-Site (Scope 3b)	2,695.4	0.0	0.0	0.0	0.0	0.0	2,695.4	Oth
Total	2,696.1	0.0	0.0	0.0	0.0	0.0	2,696.1	

Proposed Remedial Investigation = 100%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

On-site (Scope 1) = 0%

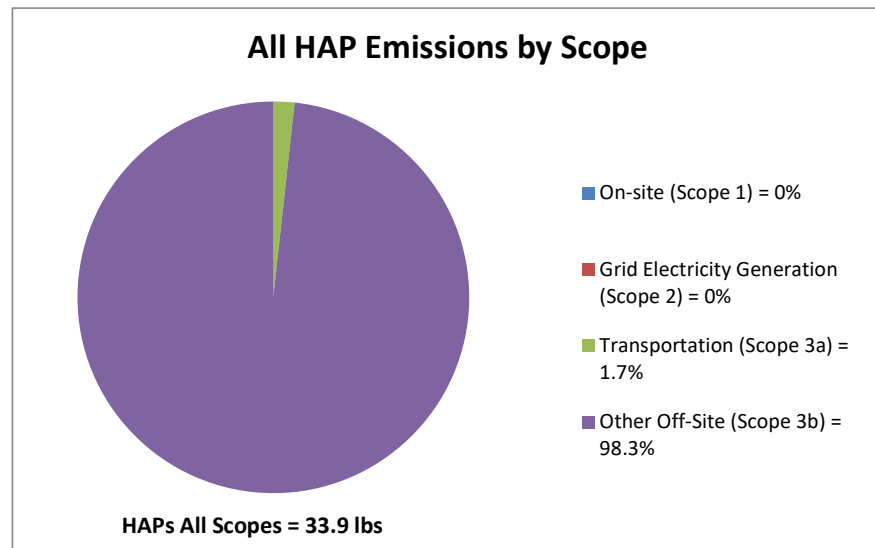
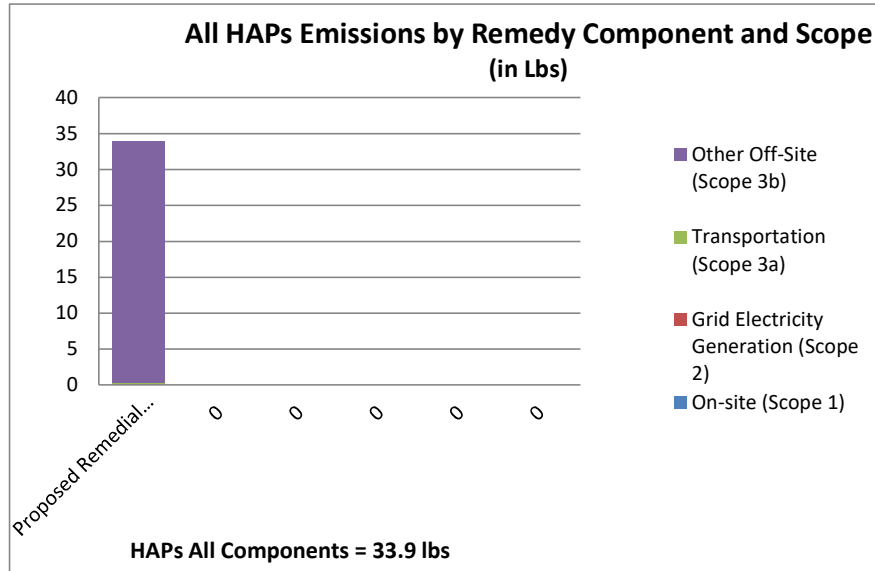
Grid Electricity Generation (Scope 2) = 0%

Transportation (Scope 3a) = 0%

Other Off-Site (Scope 3b) = 100%

PM All Components = 2696.1 lbs

PM All Scopes = 2696.1 lbs



HAPs lbs	Proposed f	0	0	0	0	0 Total	
On-site (Scope 1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation (Scope 3a)	0.6	0.0	0.0	0.0	0.0	0.0	0.6
Other Off-Site (Scope 3b)	33.3	0.0	0.0	0.0	0.0	0.0	33.3
Total	33.9	0.0	0.0	0.0	0.0	0.0	33.9

Proposed Remedial Investigation = 100%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

0 = 0%

On-site (Scope 1) = 0%

Grid Electricity Generation (Scope 2) = 0%

Transportation (Scope 3a) = 1.7%

Other Off-Site (Scope 3b) = 98.3%

HAPs All Components = 33.9 lbs

HAPs All Scopes = 33.9 lbs

June Diesel Equipment Log

Equipment ID No.	Equipment Type	Equipment Manufacturer	Equipment Model-Series	Operation Date	Hours Operated
1	Excavator	Caterpillar	321C LCR	6/4/2025	0
2	Excavator	Caterpillar	307E2	6/4/2025	0
3	Excavator	Caterpillar	CAT 315	6/4/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/4/2025	0
5	Excavator	Kobelco	140SRLC-7	6/4/2025	0
6	Generator	TechnoGen	G45	6/4/2025	0
1	Excavator	Caterpillar	321C LCR	6/5/2025	0
2	Excavator	Caterpillar	307E2	6/5/2025	0
3	Excavator	Caterpillar	CAT 315	6/5/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/5/2025	0
5	Excavator	Kobelco	140SRLC-7	6/5/2025	0
6	Generator	TechnoGen	G45	6/5/2025	0
1	Excavator	Caterpillar	321C LCR	6/6/2025	1
3	Excavator	Caterpillar	CAT 315	6/6/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/6/2025	0
5	Excavator	Kobelco	140SRLC-7	6/6/2025	0
6	Generator	TechnoGen	G45	6/6/2025	0
7	Concrete Boom Truck	Alliance Concrete Pumps / Freightliner	47 Meter 5 Section LRZ-Boom / M-2	6/6/2025	3.5
8	Concrete Trucks	Mack	GRANITE GU713	6/6/2025	2.5
1	Excavator	Caterpillar	321C LCR	6/9/2025	4
3	Excavator	Caterpillar	CAT 315	6/9/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/9/2025	0
5	Excavator	Kobelco	140SRLC-7	6/9/2025	0
6	Generator	TechnoGen	G45	6/9/2025	0
1	Excavator	Caterpillar	321C LCR	6/10/2025	1
3	Excavator	Caterpillar	CAT 315	6/10/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/10/2025	0
5	Excavator	Kobelco	140SRLC-7	6/10/2025	0
6	Generator	TechnoGen	G45	6/10/2025	0
1	Excavator	Caterpillar	321C LCR	6/11/2025	0
3	Excavator	Caterpillar	CAT 315	6/11/2025	1

June Diesel Equipment Log

Equipment ID No.	Equipment Type	Equipment Manufacturer	Equipment Model-Series	Operation Date	Hours Operated
4	Excavator	Doosan	DX420LC / DX530LC-5	6/11/2025	0
5	Excavator	Kobelco	140SRLC-7	6/11/2025	0
6	Generator	TechnoGen	G45	6/11/2025	0
7	Concrete Boom Truck	Alliance Concrete Pumps / Freightliner	47 Meter 5 Section LRZ-Boom / M-2	6/11/2025	4
8	Concrete Trucks	Mack	GRANITE GU713	6/11/2025	2
1	Excavator	Caterpillar	321C LCR	6/12/2025	7
3	Excavator	Caterpillar	CAT 315	6/12/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/12/2025	0
5	Excavator	Kobelco	140SRLC-7	6/12/2025	0
1	Excavator	Caterpillar	321C LCR	6/13/2025	5.5
3	Excavator	Caterpillar	CAT 315	6/13/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/13/2025	0
5	Excavator	Kobelco	140SRLC-7	6/13/2025	0
6	Generator	TechnoGen	G45	6/13/2025	4
6	Generator	TechnoGen	G45	6/13/2025	0
1	Excavator	Caterpillar	321C LCR	6/16/2025	1
3	Excavator	Caterpillar	CAT 315	6/16/2025	1
4	Excavator	Doosan	DX420LC / DX530LC-5	6/16/2025	0
5	Excavator	Kobelco	140SRLC-7	6/16/2025	0
6	Generator	TechnoGen	G45	6/16/2025	4
7	Concrete Boom Truck	Alliance Concrete Pumps / Freightliner	47 Meter 5 Section LRZ-Boom / M-2	6/16/2025	7
8	Concrete Trucks	Mack	GRANITE GU713	6/16/2025	8
3	Excavator	Caterpillar	CAT 315	6/17/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/17/2025	0
5	Excavator	Kobelco	140SRLC-7	6/17/2025	0
6	Generator	TechnoGen	G45	6/17/2025	0
9	Boom Truck	Cormach	240000RX E9J4D4 HP	6/17/2025	8
3	Excavator	Caterpillar	CAT 315	6/18/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/18/2025	0
5	Excavator	Kobelco	140SRLC-7	6/18/2025	0
6	Generator	TechnoGen	G45	6/18/2025	0

June Diesel Equipment Log

Equipment ID No.	Equipment Type	Equipment Manufacturer	Equipment Model-Series	Operation Date	Hours Operated
10	Boom Truck	Palfinger	PK 165.002 TEC7	6/18/2025	8
3	Excavator	Caterpillar	CAT 315	6/19/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/19/2025	0
5	Excavator	Kobelco	140SRLC-7	6/19/2025	0
6	Generator	TechnoGen	G45	6/19/2025	0
11	Excavator	SANY	SY 155U	6/19/2025	8
3	Excavator	Caterpillar	CAT 315	6/20/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/20/2025	0
5	Excavator	Kobelco	140SRLC-7	6/20/2025	0
6	Generator	TechnoGen	G45	6/20/2025	0
8	Concrete Trucks	Mack	GRANITE GU713	6/20/2025	0
11	Excavator	SANY	SY 155U	6/20/2025	8
12	Concrete Boom Truck	KCP	KCP 52ZX 170 HP	6/20/2025	10
3	Excavator	Caterpillar	CAT 315	6/23/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/23/2025	1
5	Excavator	Kobelco	140SRLC-7	6/23/2025	0
6	Generator	TechnoGen	G45	6/23/2025	0
11	Excavator	SANY	SY 155U	6/23/2025	2
9	Boom Truck	Cormach	240000RX E9J4D4 HP	6/23/2025	8
3	Excavator	Caterpillar	CAT 315	6/24/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/24/2025	0
5	Excavator	Kobelco	140SRLC-7	6/24/2025	0
6	Generator	TechnoGen	G45	6/24/2025	0
11	Excavator	SANY	SY 155U	6/24/2025	0
13	Excavator	SANY	SY35U	6/24/2025	5
3	Excavator	Caterpillar	CAT 315	6/25/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/25/2025	0
5	Excavator	Kobelco	140SRLC-7	6/25/2025	0
6	Generator	TechnoGen	G45	6/25/2025	0
11	Excavator	SANY	SY 155U	6/25/2025	0
13	Excavator	SANY	SY35U	6/25/2025	5

June Diesel Equipment Log

Equipment ID No.	Equipment Type	Equipment Manufacturer	Equipment Model-Series	Operation Date	Hours Operated
3	Excavator	Caterpillar	CAT 315	6/26/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/26/2025	0
5	Excavator	Kobelco	140SRLC-7	6/26/2025	0
6	Generator	TechnoGen	G45	6/26/2025	0
11	Excavator	SANY	SY 155U	6/26/2025	8
13	Excavator	SANY	SY35U	6/26/2025	0
3	Excavator	Caterpillar	CAT 315	6/27/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/27/2025	0
5	Excavator	Kobelco	140SRLC-7	6/27/2025	0
6	Generator	TechnoGen	G45	6/27/2025	0
11	Excavator	SANY	SY 155U	6/27/2025	6
12	Concrete Boom Truck	KCP	KCP 52ZX 170 HP	6/27/2025	7
8	Concrete Trucks	Mack	GRANITE GU713	6/27/2025	7
3	Excavator	Caterpillar	CAT 315	6/30/2025	0
4	Excavator	Doosan	DX420LC / DX530LC-5	6/30/2025	0
5	Excavator	Kobelco	140SRLC-7	6/30/2025	0
6	Generator	TechnoGen	G45	6/30/2025	0
11	Excavator	SANY	SY 155U	6/30/2025	0
9	Boom Truck	Cormach	240000RX E9J4D4 HP	6/30/2025	7

APPENDIX G

Health and Safety Plan



**HALEY & ALDRICH, INC.
SITE-SPECIFIC SAFETY PLAN**

FOR

Astoria Cove Development

26-10 9th Street, Queens, NY

Project/File No. 0211417

Gensuite EZ Scan®



BI - Developers

Prepared By: Calvin Jackson

Date: 1/22/2025

Approvals: The following signatures constitute approval of this Health & Safety Plan.

A handwritten signature in blue ink, reading 'Luke McCartney'.

Field Safety Manager: Luke J. McCartney, P.G.

Date: 1/22/2025

A handwritten signature in blue ink, consisting of stylized initials 'ML'.

Project Manager: Matthew Levy

Date: 1/22/2025

HASP Valid Through: 12-31-2025

Table of Contents

	Page
STOP WORK AUTHORITY	I
ISSUANCE AND COMPLIANCE	II
EMERGENCY EVENT PROCEDURES	III
PROJECT INFORMATION AND CONTACTS	IV
DIRECTIONS TO THE NEAREST HOSPITAL	V
DIRECTIONS TO THE NEAREST URGENT CARE	VI
1. WORK SCOPE	7
Project Task Breakdown	7
Subcontractor(s) Tasks	7
2. SITE OVERVIEW / DESCRIPTION	8
Site Classification	8
Site Description	8
Background and Historic Site Usage	8
Site Status	8
Site Plan	8
Work Areas	8
3. HAZARD ASSESSMENT	10
Site Chemical Hazards	10
Site Hazards Checklist	11
Weather	11
Biological	12
Location/Terrain	13
Miscellaneous	14
Task Hazard Summary	16
Task Physical Hazards Checklist	19
Summary of Physical Hazards & Controls	19
4. PROTECTIVE MEASURES	25
Required Safety & Personal Protective Equipment	25
5. TRAINING REQUIREMENTS	26
Site Specific Training Requirements	26
Task Specific Training Requirements	26
6. AIR MONITORING PLAN AND EQUIPMENT	26
Air Monitoring/Screening Equipment Requirements	26
Monitoring Plans	27
7. DECONTAMINATION & DISPOSAL METHODS	28
Personal Hygiene Safeguards	28
Decontamination Supplies	28

	Location of Decontamination Station	28
	Standard Personal Decontamination Procedures	29
	Disposal Methods	30
	Disposal of Single Use Personal Protective Equipment	30
8.	SITE CONTROL	31
	Communication	31
	Visitors 31	
	Zoning 31	
9.	SITE SPECIFIC EMERGENCY RESPONSE PLAN	32
	Pre-Emergency Planning	32
	Onsite Emergency Response Equipment	32
	EVACUATION ALARM	33
	EVACUATION ROUTES	33
	EVACUATION MUSTER POINT(S)/ SHELTER AREA(S)	33
	EVACUTION RESPONSE DRILLS	33
	Emergency Type	34
	Notification	34
	Response Action	34
	Evacuation Plan/Route	34
10.	HASP ACKNOWLEDGEMENT FORM	35

Attachments

Attachment A	HASP Amendment Form
Attachment B	Training Requirements
Attachment C	Roles and Responsibilities
Attachment D	Job Safety Analyses
Attachment E	Safety Data Sheets
Attachment F	Operating Procedures

STOP WORK AUTHORITY

In accordance with Haley & Aldrich (Haley & Aldrich) Stop Work Authority Operating Procedure (OP1035), any individual has the right to refuse to perform work that he or she believes to be unsafe without fear of retaliation. He or she also has the authority, obligation, and responsibility to stop others from working in an unsafe manner.

STOP Work Authority is the stop work policy for all personnel and subcontractors on the Site. When work has been stopped due to an unsafe condition, Haley & Aldrich site management (e.g., Project Manager [PM], Site Health & Safety Officer [SHSO], etc.) and the Haley & Aldrich Senior Project Manager (SPM) will be notified immediately.

Reasons for issuing a stop work order include, but are not limited to:

- The belief/perception that injury to personnel or accident causing significant damage to property or equipment is imminent.
- An Haley & Aldrich subcontractor is in breach of site safety requirements and/or their own site HASP.
- Identifying a substandard condition (e.g., severe weather) or activity that creates an unacceptable safety risk as determined by a qualified person.

Work will not resume until the unsafe act has been stopped OR sufficient safety precautions have been taken to remove or mitigate the risk to an acceptable degree. Stop work orders will be documented as part of an on-site stop work log, on daily field reports to include the activity/activities stopped, the duration, person stopping work, person in-charge of stopped activity/activities, and the corrective action agreed to and/or taken. Once work has been stopped, only the Haley & Aldrich SPM or SHSO can give the order to resume work. Haley & Aldrich senior management is committed to support anyone who exercises his or her “Stop Work” authority.

ISSUANCE AND COMPLIANCE

This HASP has been prepared in accordance with Occupational Safety and Health Administration (OSHA) regulations (CFR 29, Parts 1904, 1910, and 1926) if such are applicable.

The specific requirements of this HASP include precautions for hazards that exist during this project and may be revised as new information is received or as site conditions change.

- This HASP must be signed by all Haley & Aldrich personnel involved in implementation of the SOW (Section 2 of this HASP).
- This HASP, or a current signed copy, must be retained at all times when Haley & Aldrich staff are present.
- Revisions to this HASP must be outlined within the contents of the HASP. If immediate or minor changes are necessary, the Field Safety Manager (FSM), Haley & Aldrich, SSO and/or Project Manager (PM) may use Attachment 1 (HASP Amendment Form), presented at the end of this HASP. Any revision to the HASP requires employees and subcontractors to be informed of the changes so that they understand the requirements of the change.
- Deviations from this HASP are permitted with approval from the Haley & Aldrich FSM, PM, or Senior Health & Safety Manager (SHSM). Unauthorized deviations may constitute a violation of Haley & Aldrich company procedures/policies and may result in disciplinary action.
- This HASP will be relied upon by Haley & Aldrich's subcontractors and visitors to the site. Haley & Aldrich's subcontractors must have their own HASP which will address hazards specific to their trade that is not included in this HASP. This HASP will be made available for review to Haley & Aldrich's subcontractors and other interested parties (e.g. Facility personnel and regulatory agencies) to ensure that Haley & Aldrich has properly informed our subcontractors and others of the potential hazards associated with the implementation of the SOW to the extent that Haley & Aldrich is aware.

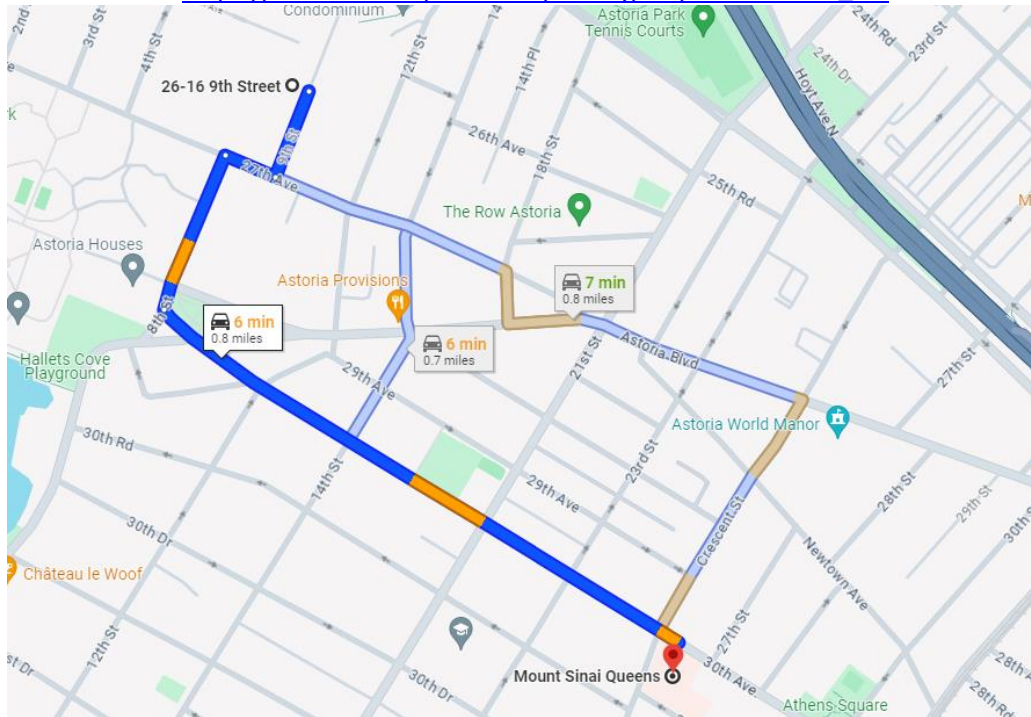
This site-specific HASP provides only site-specific descriptions and work procedures. General safety and health compliance programs in support of this HASP (e.g., injury reporting, medical surveillance, personal protective equipment (PPE) selection, etc.) are described in detail in the Haley & Aldrich Corporate Health and Safety Program Manual and within Haley & Aldrich's Standard Operating Procedures. Both the manual and SOPs can be located on the Haley & Aldrich's Company Intranet. When appropriate, users of this HASP should always refer to these resources and incorporate to the extent possible. The manual and SOPs are available to clients and regulators upon request.

EMERGENCY EVENT PROCEDURES	
1 - ASSESS THE SCENE	
<ul style="list-style-type: none"> • <u>STOP WORK</u> • Review the situation and ascertain if it's safe to enter the area. • Evacuate the site if the conditions are unsafe. 	
2 - EVALUATE THE EMERGENCY	
<ul style="list-style-type: none"> • Call 911, or designated emergency number, if required. • Provide first aid for the victim if qualified and safe to do so. <ul style="list-style-type: none"> ○ First aid will be addressed using the onsite first aid kit. * <ul style="list-style-type: none"> ▪ If providing first aid, remember to use proper first aid universal precautions if blood or bodily fluids are present. • If exposure to hazardous substance is suspected, immediately vacate the contaminated area. <ul style="list-style-type: none"> ○ Remove any contaminated clothing and/or equipment. ○ Wash any affected dermal/ocular area(s) with water for at least 15 minutes. ○ Seek immediate medical assistance if any exposure symptoms are present. <p><i>* Note: Haley & Aldrich employees are not required or expected to administer first aid / CPR to any Haley & Aldrich staff member, Contractor, or Civilian personnel at any time; it is Haley & Aldrich's position that those who do are doing so on their own behalf and not as a function of their job.</i></p>	
3 - SECURE THE AREA	
<ul style="list-style-type: none"> • Cordon off the incident area, if possible. <ul style="list-style-type: none"> ○ Notify any security personnel, if required. ○ Escort all non-essential personnel out of the area, if able. 	
4 - REPORT ON-SITE ACCIDENTS / INCIDENTS TO PM / SSO	
<ul style="list-style-type: none"> • Notify the PM and SSO as soon as it is safe to do so. <ul style="list-style-type: none"> ○ Assist PM and SSO in completing any additional tasks, as required. 	
5 - INVESTIGATE / REPORT THE INCIDENT	
<ul style="list-style-type: none"> • Record details of the incident for input to the Gensuite. <ul style="list-style-type: none"> ○ Complete any additional forms as requested by the PM and SSO. 	
6 - TAKE CORRECTIVE ACTION	
<ul style="list-style-type: none"> • Implement corrective actions per the PM following root cause analysis. <ul style="list-style-type: none"> ○ Complete Lessons Learned form. 	

PROJECT INFORMATION AND CONTACTS	
Project Name: Astoria Cove Development	Haley & Aldrich File No.: 0211417
Location: 26-10 9 th Street, Queens, NY	
Client/Site Contact: Phone Number:	Mike Strohli 347.773.4320
Haley & Aldrich Field Representative: Phone Number: Emergency Phone Number:	Calvin Jackson 929.729.1243 914.343.4057
Haley & Aldrich Project Manager: Phone Number: Emergency Phone Number:	Matthew Levy 646.893.4733 516.666.5382
Field Safety Manager: Office Phone Number: Cell Phone Number:	Luke McCartney 646.568.9357 551.655.7720
Subcontractor Project Manager: Phone Number:	Luis Cruz (CAD3 Construction & Development) 347.773.3427
Nearest Hospital: Address: (see map on next page) Phone Number:	Mount Sinai Queens 25-10 30 th Avenue Long Island City, NY 11102 718.932.1000
Nearest Occ. Health Clinic: http://www.talispoint.com/liberty/ext/ Address: (see map on next page) Phone Number:	Mobile Health Corporate 11-25 44th Rd Queens, NY 11101 212.695.5122
Liberty Mutual Claim Policy	WC6-Z11-254100-035
WorkCare Injury & Illness Hotline	1-888-449-7787
Emergency Response Number:	911
Other Local Emergency Response Number:	N/A
Other Ambulance, Fire, Police, or Environmental Emergency Resources:	911

DIRECTIONS TO THE NEAREST HOSPITAL

https://www-lv.talispoint.com/liberty/ext/?uloc=MAIN_CU



Directions to the Nearest Hospital:

6 min (0.8 mile)

via 30th Ave.

Best route, despite the usual traffic



26-16 9th St

Long Island City, NY 11102

↑ Head south on 9th St toward 27th Ave

394 ft

↪ Turn right onto 27th Ave

236 ft

↶ Turn left onto 8th St

0.1 mi

↶ Turn left onto 30th Ave.

i Destination will be on the right

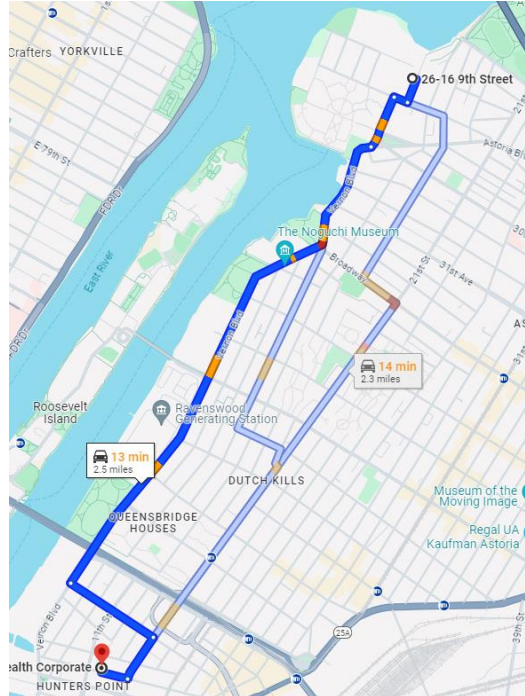
0.5 mi

Mount Sinai Queens

25-10 30th Ave., Long Island City, NY 11102

DIRECTIONS TO THE NEAREST URGENT CARE

https://www-lv.talispoint.com/liberty/ext/?uloc=MAIN_CU



Directions to the Nearest Occupational Clinic:

Paste map and directions showing route to nearest hospital here.

13 min (2.5 miles)

via Vernon Blvd

Fastest route, despite the usual traffic



26-16 9th St

Long Island City, NY 11102

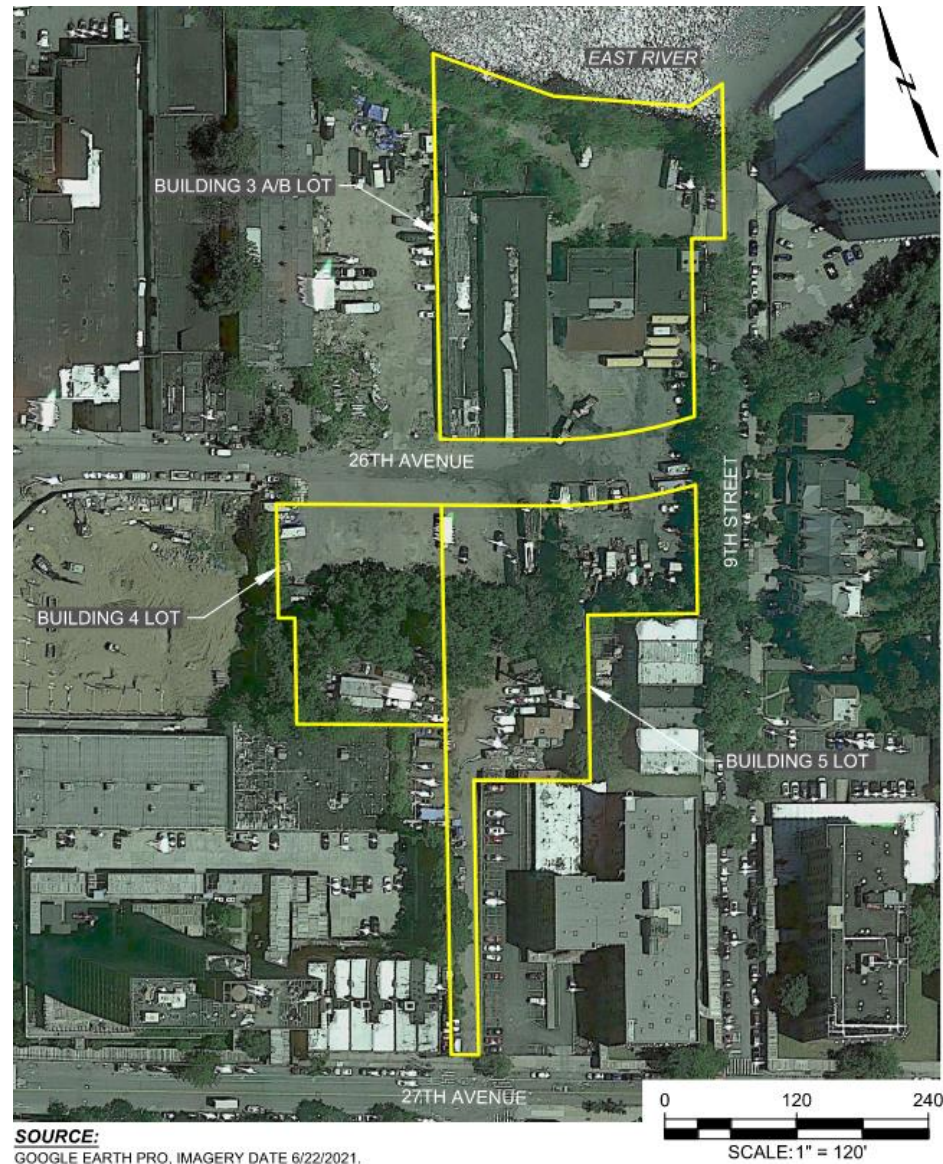
- ↑ Head south on 9th St toward 27th Ave
394 ft
- ➔ Turn right onto 27th Ave
236 ft
- ➔ Turn left onto 8th St
0.2 mi
- ➔ 8th St turns right and becomes Vernon Blvd
1.7 mi
- ➔ Turn left onto 43rd Ave
0.3 mi
- ➔ Turn right onto 21st St
0.1 mi
- ➔ Turn right onto 44th Rd
430 ft

Mobile Health Corporate
11-25 44th Rd, Queens, NY 11101

1. WORK SCOPE			
<p>This Site-Specific Health and Safety Plan addresses the health and safety practices and procedures that will be exercised by all Haley & Aldrich employees participating in all work on the Project Site. This plan is based on an assessment of the site-specific health and safety risks available to Haley & Aldrich and Haley & Aldrich's experience with other similar project sites. The scope of work includes the following:</p> <p>Project tasks include waste characterization, remedial oversight, and endpoint sampling.</p>			
Project Task Breakdown			
Task No.	Task Description	Employee(s) Assigned	Work Date(s) or Duration
1	Waste Characterization	Matthew Cal	07/17/2024-07/19/2024
2	Remedial Oversight	Calvin Jackson	2 years
3	Endpoint Sampling	Calvin Jackson	6 months
Subcontractor(s) Tasks			
Firm Name		Work Activity	Work Date(s) or Duration
Lakewood Environmental Services Corp.		Drilling	07/17/2024-07/19/2024
CAD3 Construction & Development		Excavation/Piling	2 years
Projected Start Date: 7/17/2024			
Projected Completion Date: 7/17/2026			

2. SITE OVERVIEW / DESCRIPTION
Site Classification
Mixed use (commercial and residential)
Site Description
<p>The Site is located at 26-10 9th Street in the Astoria section in Queens, New York and is identified as Block 906 Lots 1 & 5, Block 907 Lot 1, Block 908 Lot 12, and Block 909 Lot 35 on the New York City Tax Map. The Site is approximately 135,940-square feet and is bounded by the East River to the north, 27th Avenue to the south, 9th Street and eight residential buildings to the east, and two open lots, a commercial building, a mixed-use commercial and residential building, and a residential building to the west. An unimproved segment of 26th Avenue and an easement for 8th Street are also present on-Site. A map of the site boundary is shown in Figure 2.</p>
Background and Historic Site Usage
The Site was developed for industrial use in the 1930s to 1940s and has always been used for industrial, manufacturing, or commercial purposes.
Site Status
<p>Indicate current activity status and describe operations at the site:</p> <p>Active</p> <p>Currently, the Site is used for storage of equipment and materials by several contractors and contains two buildings, one of which is vacant, and the other is used to store taxi vehicles, and each contain small partial basements that extend approximately 10 feet below ground surface (ft bgs), at an elevation of approximately 10 ft NAVD88.</p>
Site Plan
Is a site plan or sketch available? Yes
Work Areas
<p>List and identify each specific work areas(s) on the job site and indicate its location(s) on the site plan:</p> <p>Buildings 3A/3B Lot - Queens Block 906, Lots 1 & 5 (Site Plan; top right)</p> <p>Building 4 Lot - Queens Block 909, Lot 35 (Site Plan; bottom left)</p> <p>Building 5 Lot - Queens Block 908, Lot 12 (Site plan; bottom right)</p>

Site Plan



3. HAZARD ASSESSMENT

Indicate all hazards that may be present at the site and for each task. If any of these potential hazards are checked, it is the Project Manager's responsibility to determine how to eliminate / minimize the hazard to protect onsite personnel.

Site Chemical Hazards

Is this Site impacted with chemical contamination? Yes

Source of information about contaminants: Previous Investigation

Contaminant of Concern	Location/Media	Concentration	Units
Tetrachloroethylene (PCE)	Soil	38.0	mg/kg
Semi Volatile Organic Compounds (SVOCs)	Soil	200.0	mg/kg
Lead	Soil	333.0	mg/kg
Mercury	Soil	1.45	mg/kg
Zinc	Soil	265.0	mg/kg
Polychlorinated biphenyls (PCBs)	Soil	3.44	mg/kg
Tetrachloroethylene (PCE)	Groundwater	11.0	ug/L
BTEX/VOCs	Soil Vapor	18.89	ug/m ³
Tetrachloroethylene (PCE)	Soil Vapor	16.7	ug/m ³

VOCs: include all organic compounds (substances made up of predominantly carbon and hydrogen) with boiling temperatures in the range of 50-260 degrees C, excluding pesticides. This means that they are likely to be present as a vapor or gas in normal ambient temperatures. Substances which are included in the VOC category include aliphatic hydrocarbons (such as hexane), aldehydes, aromatic hydrocarbons (such as benzene, toluene, and the xylenes or BTEX), and oxygenated compounds (such as acetone and similar ketones). The term VOC often is used in a legal or regulatory context and in such cases the precise definition is a matter of law.

VOCs are released from oil and gasoline refining, storage and combustion as well as from a wide range of industrial processes. Processes involving fuels, solvents, paints or the use of chemicals are the most significant sources. VOCs may also be emitted from cleaning products, degreasing products, fabrics, carpets, plastic products, glues, printed material, varnishes, wax, disinfectants, and cosmetics.

Typically, VOCs are present in gas or vapor and will enter the body by breathing contaminated air. Higher concentrations of VOCs may occur in areas of poor ventilation.

Lead: The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system. Long-term exposure to lead can result in decreased performance in some tests measuring functions of the nervous system in adults. It may also cause weakness in fingers, wrists, or

ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys and ultimately cause death.

Mercury: is an odorless, silver metallic liquid. It can be inhaled or absorbed through the skin. Contact may cause irritation to the skin or eyes. Toxic if ingested. Fume inhalation may cause irritation in the nose, throat or lungs. This is a corrosive chemical. Symptoms of poisoning include, muscle tremors, loss of appetite, and nausea. Long-term exposure may have effects on the central nervous system and kidneys. The PEL is 0.1 mg/m³ averaged over an 8 hour shift.

Zinc: is an odorless, bluish-white powder. It is typically used in paints and can be mixed with other metals to make brass and other types of alloys. Zinc can produce flammable gases when in contact with water, sometimes creating vigorous or explosive reactions. It can also create gaseous hydrogen in contact with water or moist air. Inhalation will cause irritation to eyes and respiratory system. Exposures cause flu-like symptoms, called “metal fume fever”, which can sometimes be delayed up to 48 hours after initial exposure.

Polychlorinated biphenyls (PCBs): are a group of manufactured organic chemicals that contain 209 individual chlorinated chemicals. PCBs are either oily liquids or solids and are colorless to light yellow in color. They have no known smell or taste. There are no known natural sources of PCBs. Some commercial PCB mixtures are known in the United States by their industrial trade name e.g. Aroclor.

BTEX/VOCs: BTEX is an acronym for benzene, toluene, ethylbenzene and xylenes. These compounds are VOCs, are common in petroleum-related products (e.g., oil, gasoline, coal-tar DNAPL, etc.), and frequently co-occur at hazardous waste sites. Benzene, toluene, ethylbenzene, and xylenes have acute and chronic harmful effects on the central nervous system. Benzene is classified as a carcinogen. Short-term health effects of low-level BTEX exposure include drowsiness, dizziness, accelerated heart rate, headaches, tremors, confusion, and unconsciousness.

Site Hazards Checklist			
Weather			
Hot Temperatures	Lightning Storms	Cold Temperatures	Select Hazard
<p>Hot Temperatures</p> <p>Heat stress may occur at any time work is being performed at elevated ambient temperatures. Because heat stress is one of the most common and potentially serious illnesses associated with outdoor work during hot seasons, regular monitoring and other preventative measures are vital. Site workers must learn to recognize and treat the various forms of heat stress. The best approach is preventative heat stress management.</p> <p>H&A employees and their subcontractors should be aware of potential health effects and/or physical hazards of working when there are hot temperatures or a high heat index. Refer OP1015-Heat Stress for a discussion on hot weather hazards.</p>			

Lightning Storms

Where the threat of electrical storms and the hazard of lightning exist staff shall ensure site procedures exist to: (1) detect when lightning is in the near vicinity and when there is a potential for lightning and (2) to notify appropriate site personnel of these conditions and (3) implement protocols to stop work and seek shelter.

The 30-30 Rule states that if time between seeing the lightning and hearing the thunder is less than 30 seconds, you are in danger and must seek shelter. You must also stay indoors for more than 30 minutes after hearing the last clap of thunder.

Cold Temperatures

Cold stress may occur at any time work is being performed at low ambient temperatures and high velocity winds. Because cold stress is common and has potentially serious illnesses associated with outdoor work during cold seasons, regular monitoring and other preventative measures are vital.

Refer to OP1003-Cold Stress for additional information and mitigation controls.

Biological

Mosquitoes	Stinging Insects	Large/Small Mammals	Choose an item.
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Mosquitos

Work outdoors with temperatures above freezing will likely bring staff into contact with mosquitos. There are a variety of mosquito species that can transmit a range of diseases. Birds act as reservoirs for the viruses that can be collected by the mosquito and transmitted to a person. Majority of mosquitos are mainly a nuisance but staff need to take appropriate precautions to minimize the potential transmission of a virus that can result in one of the following diseases: West Nile, Eastern Equine Encephalitides and Western Encephalitides. Knowing some key steps that can minimize the risk of mosquito bites is, therefore, important in reducing the risks. Workers working outdoors should be aware that the use of PPE techniques is essential to preventing mosquito bites especially when working at sites where mosquitoes may be active and biting.

Use repellents containing DEET, picaridin, IR3535, and some oil of lemon eucalyptus and para-menthane-diol products provide longer-lasting protection. To optimize safety and effectiveness, repellents should be used according to the label instructions. Cover as much of your skin as possible by wearing shirts with long-sleeves, long pants, and socks whenever possible. Avoid use of perfumes and colognes when working outdoors during peak times when mosquitoes may be active; mosquitoes may be more attracted to individuals wearing perfumes and colognes.

Stinging Insects

Stinging Insects fall into two major groups: Apidae (honeybees and bumblebees) and vespids (wasps, yellow jackets, and hornets). Apidae are docile and usually do not sting unless provoked. The stinger of the honeybee has multiple barbs, which usually detach after a sting. Vespids have few barbs and can

inflict multiple stings.

There are several kinds of stinging insects that might be encountered on the project site. Most stings will only result in a temporary injury. However, sometimes the effects can be more severe, even life-threatening depending on where you are stung and what allergies you have. Being stung in the throat area of the neck may cause edema (swelling caused by fluid build-up in the tissues) around the throat and may make breathing difficult.

In rare cases, a severe allergic reaction can occur. This can cause "anaphylaxis" or anaphylactic shock with symptoms appearing immediately or up to 30 minutes later. Symptoms include; Hives, itching and swelling in areas other than the sting site, swollen eyes/eyelids, wheezing, chest tightness, difficulty breathing, hoarse voice, swelling of the tongue, dizziness or sharp drop in blood pressure, shock, unconsciousness or cardiac arrest. Reactions can occur the first time you are stung or with subsequent stings. If you see any signs of reaction, or are unsure, call or have a co-worker call emergency medical services (e.g., 911) right away. Get medical help for stings near the eyes, nose or throat. Stay with the person who has been stung to monitor their reaction.

Staff who are allergic to bee stings are encouraged to inform their staff/project manager. If staff member carries an Epi-pen (i.e., epinephrine autoinjector) they are encouraged to inform their colleagues in case they are stung and are incapable of administering the injection. Examine site for any signs of activity or a hive/nest. If you see several insects flying around, see if they are entering/exiting from the same place. Most will not sting unless startled or attacked. Do not swat, let insects fly away on their own. If you must, walk away slowly or gently "blow" them away. If a nest is disturbed and you hear "wild" buzzing, protect your face with your hands and run from the area immediately. Wear long sleeves, long pants, and closed-toed boots. Wear light colored clothes such as khakis. Avoid brightly colored, patterned, or black clothing. Tie back long hair to avoid bees or wasps from entanglement. Do not wear perfumes, colognes or scented soaps as they contain fragrances that are attractive. If bee or wasp is found in your car, stop and leave windows open.

Location/Terrain			
Slip/Trip/Falls	Economically Depressed	Public Rd/Right of Way	Choose an item.
<p>Slips, Trips & Falls</p> <p>Slip and trip injuries are the most frequent injuries to workers. Statistics show most falls happen on the same level resulting from slips and trips. Both slips and trips result from unintended or unexpected change in the contact between the feet and the ground or walking surface. Good housekeeping, quality of walking surfaces (flooring), awareness of surroundings, selection of proper footwear, and appropriate pace of walking are critical for preventing fall accidents.</p> <p>Site workers will be walking on a variety of irregular surfaces, that may affect their balance. Extra care must be taken to walk cautiously near rivers because the bottom of the riverbed maybe slick and may not be visible. Rocks, gradient changes, sandy bottoms, and debris may be present but not observable.</p> <p>Take your time and pay attention to where you are going. Adjust your stride to a pace that is suitable for the walking surface and the tasks you are doing. Check the work area to identify hazards - beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain. Establish and utilize a</p>			

pathway free of slip and trip hazards. Choose a safer walking route. Carry loads you can see over. Keep work areas clean and free of clutter. Communicate hazards to on-site personnel and remove hazards as appropriate.

Economically Depressed Areas

Economically depressed areas may have high crime rates. Projects involving work in and around inactive industrial sites may bring staff into contact with indigent and homeless persons. Staff could be subjected to crime that includes but may not be limited to thievery, vandalism, and violence. Prior to the start of work staff need to understand the work locations and the potential for exposure to low level crime.

Staff members should never work alone in these areas. A buddy system is required. Conduct during daylight hours. Secure equipment and vehicles. If warranted, contact the local police department for a security detail. Leave the work area immediately and contact the local authorities if staff members feel threatened or are threatened.

Public Right of Way

H&A staff and their subcontractors conducting work on public roads and/or right of ways can be exposed to vehicular traffic and expose the public to the hazards of the job site. Where a hazard exists to site workers because of traffic or haulage conditions at work sites that encroach public streets or highways, a system of traffic controls in conformance with the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), or state program, is required. A Temporary Traffic Control Plan (TCP) describes traffic controls to be used for facilitating vehicle and pedestrian traffic through a temporary traffic control zone TCPs are required to provide for worker protection and safe passage of traffic through and around job sites with as little inconvenience and delay as possible.

The plan may range in scope from being very detailed, to merely referencing typical drawings contained in the MUTCD. The degree of detail in the TCP depends entirely on the complexity of the situation, and TCP's should be prepared by persons knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed.

H&A Project Managers or their subcontractors need to establish appropriate control measures and obtain any permits when project work is on or encroaches public roadways. You may need flaggers or police details. Cease work and notify the field supervisor immediately if any conditions are such that safety is jeopardized. Utilize protective vehicles whenever appropriate or position equipment so in between the work and oncoming traffic.

Miscellaneous

Extended Shift	Choose an item.	Choose an item.	Choose an item.
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Extended Shift

An extended shift can include extending a workday beyond eight hours. Extended or unusual work shifts may be more stressful physically, mentally, and emotionally. Non-traditional shifts and extended work hours may disrupt the body's regular schedule, leading to increased fatigue, stress, and lack of concentration. This leads to an increased risk of operator error, injuries and/or accidents. The degree to

which an individual is exposed to fatigue risk factors depends upon the work schedule. As both the duration of the workday and the number of days worked increase so does the fatigue risk factors. Staff Managers need to be aware of the fatigue risk factors and ensure projects are structured to mitigate these factors. Staff Members also have a responsibility to manage the personal fatigue risk factors that they can control outside of work (e.g, duration and quality of sleep, diet, drugs, and alcohol)

Fatigue is a message to the body to rest and can be eliminated with proper rest. However, if rest is not possible, fatigue can increase and becomes distressing and eventually debilitating. Fatigue symptoms, both mental and physical, vary and depend on the person and degree of overexertion. Examples include: weariness, sleepiness, irritability, reduced alertness, lack of memory, concentration and motivation, increased susceptibility to illness, depression, headache, loss of appetite, and digestive problems.

When possible, managers should limit use of extended shifts and increase the number of days worked. Working shifts longer than 8 hours generally result in reduced productivity and alertness. Additional breaks and meals should be provided when working extended shift periods. Tasks requiring heavy physical labor or intense concentration should be performed at the beginning of the shift if possible. This is an important consideration for pre-emergency planning.

Make efforts, when feasible, to ensure that unavoidable extended work shifts and shift changes allow affected employees time for adequate rest and recovery. Project Managers need to plan to have an adequate number of personnel available to enable workers to take breaks, eat meals, relax, and sleep.

Plan for regular and frequent breaks throughout the work shift. If at remote sites, ensure if possible, that there is a quiet, secluded area designated for rest and recuperation. In addition to formal breaks such as lunch or dinner, encourage use of micro breaks to change positions, move about, and shift concentration. Personnel should look to obtain an adequate quantity and quality of sleep.

Task Hazard Summary**Task 1 (Waste Characterization) – Drilling**

Drilling is conducted for a range of services that can include but are not limited to: soil characterization, environmental investigation, well installation, and ore exploration. Familiarity with basic drilling safety is an essential component of all drilling projects. Potential hazards related to drilling operations include, but are not limited to encountering underground or overhead utilities, traffic and heavy equipment, hoisting heavy tools, steel impacts, open rotation entanglement, and the planned or unexpected encountering of toxic or hazardous substances. While staff members do not operate drilling equipment, they may work in close proximity to operating drilling equipment and may be exposed to many of the same hazards as the drilling subcontractor. It is imperative that staff are aware of emergency stops and establish communication protocols with the drillers prior to the start of work.

See OP 1002 Drilling Safety for more information.

Task 1 (Waste Characterization) – Soil Sampling

Soil sampling by H&A staff on active construction sites can be conducted in conjunction with a wide range activities such as building construction, earthwork and soil management related activities. These activities can include, but are not limited to: drill spoil characterization and management during building foundation element installation, characterization of excavated soils for management/disposal/reuse during earthwork activities, and as part of environmental remedial activities such as delineation and confirmation sampling. Familiarity with basic heavy construction safety, site conditions (geotechnical and environmental), and potential soil contaminants are essential components of soil sampling performed on active sites. Potential hazards related to soil sampling at construction sites include, but are not limited to: encountering site vehicle traffic and heavy equipment operations, manual lifting, generated waste, contact or exposure to impacted soil, and encountering unknown toxic or hazardous substances. Although soil sampling is commonly performed within active excavations, from stockpiles, or within trench excavations, sampling locations and situations will vary depending on site conditions. Care should be taken while entering and exiting excavations or trenches, and when accessing (climbing up or down) soil stockpiles, ensuring that the sampling area is not being actively accessed by construction equipment. Care should also be taken with handling of potentially environmentally impacted soil during sampling, with appropriate PPE identified and used. At no time during classification activities are personnel to reach for debris near machinery that is in operation, place any samples in their mouth, or come in contact with the soils without the use of gloves. Staff will have to carry and use a variety of sampling tools, equipment, containers, and potentially heavy sample bags. It is imperative that staff are aware of emergency / communication protocols with the Contractor prior to the start of work.

Task 2 (Remedial Oversight) – Excavation/Trenching

There are multiple hazards associated with working in and around excavations and trenches including cave-ins, potential running soils, dislodged excavated soils, lack of proper access and egress. Nonfatal, and even fatal, injuries may occur in association with excavation and trenching activities with a greater

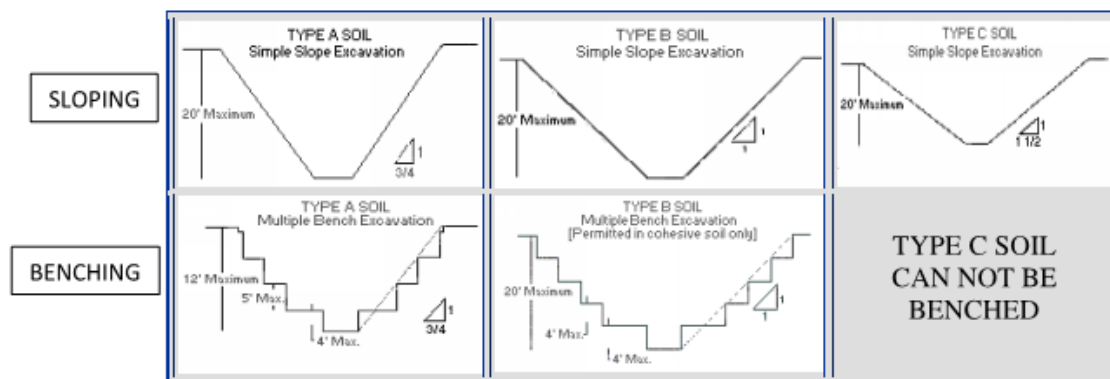
frequency than one might expect. Causes of bodily injury, illness, or death include asphyxiation, internal injuries due to physical crushing, falling objects and toxic exposures.

Excavations five (5) feet deep or greater require a protective system unless the excavation is made entirely in stable rock. If the depth is less than five (5) feet deep, a competent person may determine that a protective system is not required. Trenches 20 feet deep or greater require that the protective system be designed by a registered professional engineer or be based on tabulated data prepared and/or approved by a registered professional.

H&A Staff Members shall not enter a trench that is five feet deep or greater unless a protective system is used or the soil(s) have been characterized and benched and/or sloped appropriately.

The following are list identifies the types of protective measures that can be used in the event a staff member is required to enter an excavation or trench.

- **Sloping** involves cutting back the trench wall at an angle inclined away from the excavation.
- **Benching** means a method of protecting workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels. Benching cannot be done in Type C soil. Below is a diagram indicating the appropriate slope angle for both sloping and benching.



- **Shoring** requires installing aluminum hydraulic or other types of supports to prevent soil movement and cave-ins.
- **Shielding** protects workers by using trench boxes or other types of supports to prevent soil cave-ins.

Designing a protective system can be complex because you must consider many factors: soil classification, depth of cut, water content of soil, changes caused by weather or climate, surcharge loads (e.g., spoil, other materials to be used in the trench) and other operations in the vicinity.

See OP 1001 Excavation and Trenching Safety for more information.

Task 2 (Remedial Oversight) - Hauling Soils Off-site

Hauling Soils Off-site is conducted for a range of services that can include but are not limited to: building, foundation, utility excavation and environmental cleanup. Familiarity with basic heavy

construction safety is an essential component of all hauling projects. Potential hazards related to hauling soils off-site operations include, but are not limited to encountering underground or overhead utilities, traffic and heavy equipment, generated waste, and the use or unexpected encountering of toxic or hazardous substances. While staff members do not operate heavy equipment, they may work in close proximity to the equipment and may be exposed to many of the same hazards as the Contractor. Care should be taken during loading of truck/container that the staff is not in the line of fire of the loading equipment (swing radius/traffic pattern) or of the falling spoils/soil from the loading bucket or truck bed. The staff should be aware at all times of subsurface stability as a truck may tip during truck loading and unloading due items such as but not limited to uneven surface, poorly or uncompacted subsurface, thawing soils, saturated soils and proximity to excavation. It is imperative that staff are aware of emergency / communication protocols with the Contractor prior to the start of work.

Task 2 (Remedial Oversight) - Mini-Piles/Micro-Piles

Installation of mini-piles is conducted for a range of services that can include but are not limited to: bridge, dock and building foundation installation. Familiarity with basic heavy construction safety is an essential component of all pile installations. Potential hazards related to mini-pile installation include, but are not limited to encountering line of fire, underground or overhead utilities, noise, traffic and heavy equipment, overhead work, cranes or lifting equipment, slippery surfaces, and rotating equipment. While staff members do not operate heavy equipment, they will work in close proximity to the equipment and may be exposed to many of the same hazards as the Contractor. Staff should be aware at all times of all overhead hoisting operations even during pile installation. Staff should always maintain a safe distance from the rig as the installation may create all or some of the following: airborne debris and blow-back – caused by pressurized water or air; slippery/wet/muddy surfaces; limited access/egress; and, close proximity to rotating equipment. It is imperative that staff are aware of emergency / communication protocols with the Contractor prior to the start of work.

Task 3 (Endpoint Sampling) – Soil Sampling

Soil sampling by H&A staff on active construction sites can be conducted in conjunction with a wide range activities such as building construction, earthwork and soil management related activities. These activities can include, but are not limited to: drill spoil characterization and management during building foundation element installation, characterization of excavated soils for management/disposal/reuse during earthwork activities, and as part of environmental remedial activities such as delineation and confirmation sampling. Familiarity with basic heavy construction safety, site conditions (geotechnical and environmental), and potential soil contaminants are essential components of soil sampling performed on active sites. Potential hazards related to soil sampling at construction sites include, but are not limited to: encountering site vehicle traffic and heavy equipment operations, manual lifting, generated waste, contact or exposure to impacted soil, and encountering unknown toxic or hazardous substances. Although soil sampling is commonly performed within active excavations, from stockpiles, or within trench excavations, sampling locations and situations will vary depending on site conditions. Care should be taken while entering and exiting excavations or trenches, and when accessing (climbing up or down) soil stockpiles, ensuring that the sampling area is not being actively accessed by construction equipment. Care should also be taken with handling of potentially environmentally impacted soil during sampling, with appropriate PPE identified and used. At no time during classification

activities are personnel to reach for debris near machinery that is in operation, place any samples in their mouth, or come in contact with the soils without the use of gloves. Staff will have to carry and use a variety of sampling tools, equipment, containers, and potentially heavy sample bags. It is imperative that staff are aware of emergency / communication protocols with the Contractor prior to the start of work.

Task Physical Hazards Checklist			
Potential Task Hazards	Task 1 Waste Characterization	Task 2 Remedial Oversight	Task 3 Endpoint Sampling
Ergonomics	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Congested Area	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Generated Wastes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Heavy Equipment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Manual Lifting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Underground Utilities	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Line of Fire	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Noise	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Sharp Objects	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ground Disturbance	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Traffic	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Summary of Physical Hazards & Controls

Ergonomics

Most Work-related Musculoskeletal Disorders (WMSDs) are caused by Ergonomic Stressors. Ergonomic Stressors are caused by poor workplace practices and/or insufficient design, which may present ergonomic risk factors. These stressors include, but not limited to, repetition, force, extreme postures, static postures, quick motions, contact pressure, vibration, and cold temperatures.

WMSDs are injuries to the musculoskeletal system, which involves bones, muscles, tendons, ligaments, and other tissues in the system. Symptoms may include numbness, tightness, tingling, swelling, pain, stiffness, fatigue, and/or redness. WMSD are usually caused by one or more Ergonomic Stressors. There may be individual differences in susceptibility and symptoms among employees performing similar tasks. Any symptoms are to be taken seriously and reported immediately.

See OP1053 Ergonomics for more information.

Controls

- Ensure workstations are ergonomically correct so bad posture is not required to complete tasks.
- Take periodic breaks over the course of the day.
- Stretch during break times.
- Break up tasks that require repetitive motion.
- Contact Corporate H&S with any ergonomic concerns

Congested Areas

Working in congested areas can expose both workers and the public to a wide range of hazards depending upon the specific activities taking place. Staff Members need to understand the work scope, work areas, equipment on-site, and internal traffic patterns to minimize or eliminate exposure potential.

Controls

- Provide barricades, fencing, warning signs/signals and adequate lighting to protect people while working in or around congested areas.
- Vehicles and heavy equipment with restricted views to the rear should have functioning back-up alarms that are audible above the surrounding noise levels. Whenever possible, use a signaler to assist heavy equipment operators and/or drivers in backing up or maneuvering in congested areas.
- Lay out traffic control patterns to eliminate excessive congestion.
- Workers in congested areas should always wear high visibility clothing.
- Be aware of Line of Fire hazards when performing work activities in congested areas.
- Hazards associated with SIMOPs should be discussed daily at Tailgate Safety Meetings.

Generated Waste

Activities on environmental sites may generate waste that requires regulated handling and disposal. Excess sample solids, decontamination materials, poly sheeting, used PPE, etc. that are determined to be free of contamination through field or laboratory screening can usually be disposed into client-approved, on-site trash receptacles. Uncontaminated wash water may be discarded onto the ground surface away from surface water bodies in areas where infiltration can occur. Contaminated materials must be segregated into liquids or solids and drummed separately for off-site disposal.

Controls

- Manage waste properly through good work practices.
- Collect, store, containerize waste, and dispose of it properly.
- All wastes generated shall be containerized in an appropriate container (i.e. open or closed top 55-gallon drum, roll-off container, poly tote, cardboard box, etc.) as directed by the PM.
- Containers should be inspected for damages or defects
- Waste containers should be appropriately labeled indicating the contents, date the container was filled, owner of the material (including address) and any unique identification number, if necessary.
- Upon completion of filling the waste container, the container should be inspected for leaks and an appropriate seal.

Heavy Equipment

Staff must be careful and alert when working around heavy equipment, failure or breakage and limited visibility can lead to accidents and worker injury. Heavy equipment such as cranes, drills, haul trucks, or other can fail during operation increasing chances of worker injury. Equipment of this nature shall be visually inspected and checked for proper working order prior to commencement of field work. Those operating heavy equipment must meet all requirements to operate the equipment. Haley & Aldrich, Inc. staff that supervise projects or are associated with high risk projects that involve digging or drilling should use due diligence when working with a construction firm.

See OP1052 Heavy Equipment for additional information.

Controls

- Only approach equipment once you have confirmed contact with the operator (e.g., operator places the bucket on the ground).
- Always maintain visual contact with operators and keep out of the strike zone whenever possible.
- Always be alert to the position of the equipment around you.
- Always approach heavy equipment with an awareness of the swing radius and traffic routes of all equipment and never go beneath a hoisted load.
- Avoid fumes created by heavy equipment exhaust.

Manual Lifting/Moving

Most materials associated with investigation, remedial, or construction-related activities are moved by hand. The human body is subject to damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process.

Controls

- Under no circumstances should any one person lift more than 49 pounds unassisted.
- Always push, not pull, the object when possible.
- Size up the load before lifting. If it is heavy or clumsy, get a mechanical aid or help from a worker.
- Bend the knees; it is the single most important aspect of lifting.
- When performing the lift:
 - Place your feet close to the object and center yourself over the load.
 - Get a good handhold.
 - Lift straight up, smoothly and let your legs do the work, not your back!
 - Avoid overreaching or stretching to pick up or set down a load.
 - Do not twist or turn your body once you have made the lift.
 - Make sure beforehand that you have a clear path to carry the load.
 - Set the load down properly.

Underground Utilities

Various forms of underground/overhead utility lines or conveyance pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. Should intrusive operations cause equipment to come into contact with utility lines, the SHSO, Project Manager, and Regional H&S Manager shall be notified immediately. Work will be suspended until the client and applicable utility agency is contacted and the appropriate actions for the situation can be addressed.

See OP1020 Work Near Utilities for complete information.

Controls

- Obtain as-built drawings for the areas being investigated from the property owner;
- Visually review each proposed soil boring locations with the property owner or knowledgeable site representative;
- Perform a geophysical survey to locate utilities;
- Hire a private line locating firm to determine location of utility lines that are present at the property;
- Identifying a no-drill or dig zone;
- Hand dig or use vacuum excavation in the proposed ground disturbance locations if insufficient data is unavailable to accurately determine the location of the utility lines.

Line of Fire

Line of fire refers to the path an object will travel. Examples of line of fire situations typically observed on project sites include lifting/hoisting, lines under tension, objects that can fall or roll, pressurized objects or lines, springs or stored energy, work overhead, vehicles and heavy equipment.

Controls

- Never walk under a suspended load.
- Be aware and stay clear of tensioned lines such as cable, chain and rope.
- Be cautious of torque stresses that drilling equipment and truck augers can generate. Equipment can rotate unexpectedly long after applied torque force has been stopped.
- Springs and other items can release tremendous energy if compressed and suddenly released
- Items under tension and pressure can release tremendous energy if it is suddenly released.
- Not all objects may be overhead; be especially mindful of top-heavy items and items being transported by forklift or flatbed.
- Secure objects that can roll such as tools, cylinders, and pipes.
- Stay clear of soil cuttings or soil stockpiles generated during drilling operations and excavations, be aware that chunks of soil, rocks, and debris can fall or roll.

Noise

Working around heavy equipment (drill rigs, excavators, etc.) often creates excessive noise. The effects of noise include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities. Noise monitoring data that indicates that working within 25 feet of operating heavy equipment result in exposure to hazardous levels of noise (levels greater than 85 dBA).

See OP 1031 Hearing Conservation for additional information.

Controls

- Personnel are required to use hearing protection (earplugs or earmuffs) within 25 feet of any operating piece of heavy equipment.
- Limit the amount of time spent at a noise source.
- Move to a quiet area to gain relief from hazardous noise sources.
- Increase the distance from the noise source to reduce exposure.

Sharp Objects

Workers who handle sharp edged objects like sheets of steel or glass are at risk of cuts. Workers who handle sharp edged objects are also at risk of cuts. Injuries may occur to hands, fingers, or legs when they are in the way of the blade, when the blade slips, or if an open blade is handled unexpectedly. Other hazards at job sites include stepping on sharp objects (e.g. wooden boards with protruding nails, sharp work-tools, chisels, etc.) and colliding with sharp and/or protruding objects.

Controls

Always be alert when handling sharps. Never look away or become distracted while handling sharp objects. Use caution when working with tools; use right tool for the job. Keep tools sharp, dull blades are a safety hazard, requiring more force to make cuts which can lead to tool slippage. Wear appropriate PPE and do not handle sharp objects (i.e., broken glass) with bare hands. Use mechanical devices, when possible. Stay away from building debris; avoid handling site debris or placing your hand where you cannot see. Watch out for barbed wire and electrical fences; cover with a car mat or equivalent to cross or walk around; use the buddy system to avoid entanglement; wear gloves. Do not leave unprotected sharps unattended. Use protective shields, cases, styrofoam blocks, etc. Pass a sharp by handing it over carefully by the handle with the blade down or retracted. Fixed open blades are prohibited. Always cut away from the body, making several passes when cutting thicker materials. Make sure blades are fitted properly into the knife. Never cut items with a blade or other sharp object on your lap. Never try to catch a blade or cutting tool that is falling.

Ground Disturbance

Ground disturbance is defined as any activity disturbing the ground. Ground disturbance activities include, but are not limited to, excavating, trenching, drilling (either mechanically or by hand), digging, plowing, grading, tunneling and pounding posts or stakes.

Because of the potential hazards associated with striking an underground utility or structure, the operating procedure for underground utility clearance shall be followed prior to performing any ground disturbance activities.

See OP1020 Working Near Utilities

Controls

Prior to performing ground disturbance activities, the following requirements should be applied:

- Confirm all approvals and agreements (as applicable) either verbal or written have been obtained.
- Request for line location has been registered with the applicable One-Call or Dial Before You Dig organization, when applicable.
 - Whenever possible, ground disturbance areas should be adequately marked or staked prior to the utility locators site visit.
- Notification to underground facility operator/owner(s) that may not be associated with any known public notification systems such as the One-Call Program regarding the intent to cause ground disturbance within the search zone.
- Notifications to landowners and/or tenant, where deemed reasonable and practicable.
- Proximity and Common Right of Way Agreements shall be checked if the line locator information is inconclusive.

Traffic

To ensure worker protection and the safe passage of traffic through and around job sites, Site Traffic Control procedures may need to be implemented on project sites. Job zone control and traffic management are necessary when Simultaneous Operations (SIMOPS) or third parties could be at risk of injury by entering the work zone, or when the work crew is at risk of injury by other operations.

Traffic patterns shall be evaluated. Conditions such as high pedestrian traffic, peak periods, daily deliveries or SIMOPS known, Heavy equipment traffic volume and light duty traffic volume shall be evaluated

Early identification and planning for site operations that require job zone control and traffic management, including SIMOPS, is the responsibility of the Project Manager and primary contractor manager. Traffic control plans shall be consistent with the Manual on Uniform Traffic Control Devices.

See OP1025 Signs, Signals, and Barricades and/or OP1043 Site Traffic Control for more information.

Controls

- Alternate walkways where possible.
- Use of the local police to direct traffic.
- Use of an air horn to alert drivers or other workers.
- Maintain good housekeeping and clean the area as work is completed.
- Use the 'buddy' or 'watchperson' system while performing work.
- Use a spotter for backing, tight maneuvers and bin/tank/equipment drop-offs.
- Use traffic control devices, field vehicles and barricades and avoid the use of caution tape.
- Park all vehicles (with wheels in a safe direction away from work) to block traffic with a flashing yellow light. Park so that access to the vehicle is away from oncoming traffic while working.
- When parking a vehicle and equipment, utilize a 'first move forward' driving practice.
- Work in an upright position, face traffic and make eye contact with drivers when possible.
- Minimize work time in traffic.
- Establish a 'Stop Work' hand signal.
- Personnel shall always wear high visibility vest

If public sites, such as public roads, bicycle paths or footpaths, are closed or rerouted, local and regulatory requirements shall be followed and traffic control permits shall be put in place. Proper traffic guiding equipment includes stop/slow paddle signs, flaggers, flashing lights and directional signs.

All personnel on-site should be aware of the plan of the day and the Traffic Control Plan should be communicated with all parties involved during the pre-shift meeting.

4. PROTECTIVE MEASURES				
The personal protective equipment and safety equipment (if listed) is specific to the associated task. The required PPE and equipment listed must be onsite during the task being performed. Work shall not commence unless the required PPE or Safety Equipment is present.				
Required Safety & Personal Protective Equipment				
Required Personal Protective Equipment (PPE)	Task 1	Task 2	Task 3	Task 4
	Waste Characterization	Remedial Oversight	Endpoint Sampling	Enter task description.
Hard hat	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Safety Glasses	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Safety Toed Shoes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Class 2 Safety Vest	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hearing Protection	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Nitrile Gloves	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cut Resistant Gloves	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Level of protection required	D	D	D	Select
Required Safety Equipment				
First Aid Kit	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Eyewash Bottles	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5. TRAINING REQUIREMENTS

The table below lists the training requirements staff must have respective to their assigned tasks and that are required to access the Site.

Site Specific Training Requirements

HAZWOPER - 40 Hour (Initial)

HAZWOPER - 8 Hour (Annual Refresher)

Site Specific Orientation – provided by client subcontractor on-Site

Task Specific Training Requirements

Required Training Type	Task 1	Task 2	Task 3	Task 4
	Waste Characterization	Remedial Oversight	Endpoint Sampling	Enter task description.
HAZWOPER- 40 Hour (Initial), HAZWOPER- 8 Hour (Annual Refresher), & Site-Specific Orientation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

6. AIR MONITORING PLAN AND EQUIPMENT

Exposures to airborne substances shall be fully characterized throughout project operations to ensure that exposure controls are effectively selected and modified as needed.

Is air/exposure monitoring required at this work site for personal protection? Yes

Is perimeter monitoring required for community protection? Yes

Air monitoring plan not applicable No

Air Monitoring/Screening Equipment Requirements

Photo-Ionization Detector (PID) 10.6eV

Particulate Meter (DustTrak)

The required equipment listed above must be on site. Work shall not commence unless the equipment is present and in working order.

Monitoring Plans

Parameter/ Contaminant	Equipment	Action Level	Response Activity
VOCs	PID 10.6 eV	< 1 ppm	Continue work and monitoring.
		>1 ppm for 5 minutes	Clear Instrument and Re-Monitor the Area. Implement PPE upgrades
		>1 ppm for >5 minutes	Evacuate the area and call the FSM and/or PM for further guidance. Implement engineering controls.
Zone Location Breathing zone and edge of Exclusion Zone.			Monitoring Interval Continual
Parameter/ Contaminant	Equipment	Action Level	Response Activity
Particulate matter (PM10)	Dust Monitor	150 ug/m ³	Dust suppression of work area using sprayed water, if conditions persist stop work and evaluate with project management and H&S team
Zone Location Breathing zone and edge of Exclusion Zone.			Monitoring Interval Continual

***If chemical does not have an action level use TLV or REL, whichever is lowest, to be used as an action level. If TLV or REL are the same as PEL, cut the PEL in half for an action level.**

7. DECONTAMINATION & DISPOSAL METHODS

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials.)

Personal Hygiene Safeguards

The following minimum personal hygiene safeguards shall be adhered to:

1. No smoking or tobacco products in any project work areas.
2. No eating or drinking in the exclusion zone.
3. It is required that personnel present on site wash hands before eating, smoking, taking medication, chewing gum/tobacco, using the restroom, or applying cosmetics and before leaving the site for the day.

It is recommended that personnel present on site shower or bathe at home at the end of each day of working on the site.

Decontamination Supplies

All decontamination should be conducted at the project site in designated zones or as dictated by Client requirements. Decontamination should not be performed on Haley & Aldrich owned or leased premises.

<input type="checkbox"/> Acetone	<input type="checkbox"/> Distilled Water	<input type="checkbox"/> Polyethylene Sheeting
<input checked="" type="checkbox"/> Alconox Soap	<input type="checkbox"/> Drums	<input type="checkbox"/> Pressure/Steam Cleaner
<input checked="" type="checkbox"/> Brushes	<input type="checkbox"/> Hexane	<input checked="" type="checkbox"/> Tap Water
<input checked="" type="checkbox"/> Disposal Bags	<input type="checkbox"/> Methanol	<input type="checkbox"/> Wash tubs
<input checked="" type="checkbox"/> 5 Gallon Buckets	<input checked="" type="checkbox"/> Paper Towels	<input type="checkbox"/> Other: Specify

Location of Decontamination Station

Decontamination will take place prior to leaving the site at the exit.

Standard Personal Decontamination Procedures

Outer gloves and boots should be decontaminated periodically as necessary and at the end of the day. Brush off solids with a hard brush and clean with soap and water or other appropriate cleaner whenever possible. Remove inner gloves carefully by turning them inside out during removal. Wash hands and forearms frequently. It is good practice to wear work-designated clothing while on-site which can be removed as soon as possible. Non-disposable overalls and outer work clothing should be bagged onsite prior to laundering. If gross contamination is encountered on-site contact the Project Manager and Field Safety Manager to discuss proper decontamination procedures.

The steps required for decontamination will depend upon the degree and type of contamination but will generally follow the sequence below.

1. Remove and wipe clean hard hat
2. Rinse boots and gloves of gross contamination
3. Scrub boots and gloves clean
4. Rinse boots and gloves
5. Remove outer boots (if applicable)
6. Remove outer gloves (if applicable)
7. Remove Tyvek coverall (if applicable)
8. Remove respirator, wipe clean and store (if applicable)
9. Remove inner gloves (if outer gloves were used)

PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles.

Small Equipment Decontamination

Pretreatment of heavily contaminated equipment may be conducted as necessary:

1. Remove gross contamination using a brush or wiping with a paper towel
2. Soak in a solution of Alconox and water (if possible)
3. Wipe off excess contamination with a paper towel

Standard decontamination procedure:

4. Wash using a solution of Alconox and water
5. Rinse with potable water
6. Rinse with methanol (or equivalent)
7. Rinse with distilled/deionized water

Inspect the equipment for any remaining contamination and repeat as necessary.

Disposal Methods
Procedures for disposal of contaminated materials, decontamination waste, and single use personal protective equipment shall meet applicable client, local, State, and Federal requirements.
Disposal of Single Use Personal Protective Equipment
PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles. PPE that is grossly contaminated must be bagged (sealed) and field personnel should communicate with the Project Manager to determine proper disposal.
<div>Disposal Method for Contaminated Soil</div> <ul style="list-style-type: none"> Contaminated soil cuttings and spoils must be containerized for disposal off-site unless otherwise specifically directed. Soil cuttings and spoils determined to be free of contamination through field screening can usually be returned to the boreholes or excavations from which they came.

8. SITE CONTROL

The overall purpose of site control is to minimize potential contamination of workers, protect the public from the site's hazards, and prevent vandalism. Site control is especially important in emergency situations. The degree of site control necessary depends on site characteristics, site size, and the surrounding community. The following information identifies the elements used to control the activities and movements of people and equipment at the project site.

Communication
Internal Haley & Aldrich site personnel will communicate with other Haley & Aldrich staff member and/or subcontractors or contractors with: Face to Face Communication
External H&S site personnel will use the following means to communicate with off-site personnel or emergency services. Cellular Phones
Visitors
Project Site Will visitors be required to check-in prior to accessing the project site? Yes
Visitor Access Authorized visitors that require access to the project site need to be provided with known information with respect to the site operations and hazards as applicable to the purpose of their site visit. Authorized visitors must have the required PPE and appropriate training to access the project site. Matthew Cal is responsible for facilitating authorized visitor access.
Zoning
Work Zone The work zone will be clearly delineated to ensure that the general public or unauthorized worker access is prevented. The following will be used: Cones Barricades Temporary Fencing

9. SITE SPECIFIC EMERGENCY RESPONSE PLAN

The Emergency Response Plan addresses potential emergencies at this site, procedures for responding to these emergencies, roles, responsibilities during emergency response, and training. This section also describes the provisions this project has made to coordinate its emergency response with other contractors onsite and with offsite emergency response organizations (as applicable).

During the development of this emergency response plan, local, state, and federal agency disaster, fire, and emergency response organizations were consulted (if required) to ensure that this plan is compatible and integrated with plans of those organizations. Documentation of the dates of these consultations are the names of individuals contacted is kept on file and available upon request.

The site has been evaluated for potential emergency occurrences, based on site hazards, and the major categories of emergencies that could occur during project work are:

- Fire(s)/Combustion
- Hazardous Material Event
- Medical Emergency
- Natural Disaster

A detailed list of emergency types and response actions are summarized in Table X below. Prior to the start of work, the SSO will update the table with any additional site-specific information regarding evacuations, muster points, or additional emergency procedures. The SSO will establish evacuation routes and assembly areas for the Site. All personnel entering the Site will be informed of these routes and assembly areas.

Pre-Emergency Planning

Before the start of field activities, the Project Manager will ensure preparation has been made in anticipation of emergencies. Preparatory actions include the following:

Meeting with the subcontractor/and or client concerning the emergency procedures in the event a person is injured. Appropriate actions for specific scenarios will be reviewed. These scenarios will be discussed, and responses determined before the sampling event commences. A form of emergency communication (i.e.; Cell phone, Air horn, etc.) between the Project Manager and subcontractor and/or client will be agreed on before the work commences.

A training session (i.e., “safety meeting”) given by the Project Manager or their designee informing all field personnel of emergency procedures, locations of emergency equipment and their use, and proper evacuation procedures.

Ensuring field personnel are aware of the existence of the emergency response HASP and ensuring a copy of the HASP accompanies the field team(s).

Onsite Emergency Response Equipment

Emergency procedures may require specialized equipment to facilitate work rescue, contamination control and reduction or post-emergency cleanup. Emergency response equipment stocked

Table 9.1 Emergency Equipment and Emergency PPE			
Emergency Equipment	Specific Type	Quantity Stocked	Location Stored
First Aid Kit	General First Aid Kit	1	With H&A personnel
Fire Extinguisher	A/B/C	1	25 feet of Drill Rig

EVACUATION ALARM
Verbal Communication (Site Personnel are adjacent in work zone)
EVACUATION ROUTES
Will be given a map after site specific training
EVACUATION MUSTER POINT(S)/ SHELTER AREA(S)
Will be given a locations after site specific training
EVACUTION RESPONSE DRILLS
The Site relies on outside emergency responders and a drill is not required.

Table 9-2 – Emergency Planning

Emergency Type	Notification	Response Action	Evacuation Plan/Route
Chemical Exposure	Report event to SSO immediately	Refer to Safety Data Sheet for required actions	Remove personnel from work zone
Fire - Small	Notify SSO and contact 911	Use fire extinguisher if safe and qualified to do so	Mobilize to <i>Muster Point</i>
Fire – Large/Explosion	Notify SSO and contact 911	Evacuate immediately	Mobilize to <i>Muster Point</i>
Hazardous Material – Spill/Release	Notify SSO; SSO will contact PM to determine if additional agency notification is	If practicable don PPE and use spill kit and applicable procedures to contain the release	See Evacuation Map for route, move at least 100 ft upwind of spill location
Medical – Bloodborne Pathogen	Notify SSO	If qualified dispose in container or call client or city to notify for further instruction.	None Anticipated
Medical – First Aid	Notify SSO	If qualified perform first aid duties	None Anticipated
Medical – Trauma	If life threatening or transport is required call 911, immediately	Wait at site entrance for ambulance	Noe Anticipated
Security Threat	Notify SSO who will call 911 as warranted	Keep all valuables out of site and work zones delineated.	None Anticipated
Weather – Earthquake/Tsunami’s	STOP WORK and evacuate Site upon any earthquake	Turn off equipment and evacuate as soon as is safe to do so	Mobilize to <i>Shelter Location</i>
Weather – Lightning Storm	STOP WORK	Work may resume 30 minutes after the last observed lightning.	None Anticipated
Weather – Tornadoes/Hurricanes	Monitor weather conditions STOP WORK and evacuate the site	Evacuate to shelter location or shelter in place immediately	Mobilize to <i>Shelter Location</i>
<u>MUSTER POINT</u> Sidewalk along Wythe Avenue		<u>SHELTER LOCATION</u> Personal vehicle	
In case of site emergencies, site personnel shall be evacuated per this table and will not participate in emergency response activities. Site emergencies shall be reported to local, state, and federal governmental agencies as required.			

[illegible]

**ATTACHMENT A
HASP AMENDMENT FORM**

HASP AMENDMENT FORM

This form is to be used whenever there is an immediate change in the project scope that will require an amendment to the HASP. For project scope changes associated with “add-on” tasks, the changes must be made in the body of the HASP. Before changes can be made, a review of the potential hazards must be initiated by the Haley & Aldrich Project Manager.

This original form must remain on site with the original HASP. If additional copies of this HASP have been distributed, it is the Project Manager’s responsibility to forward a signed copy of this amendment to those who have copies.

Amendment No.	
Site Name	
Work Assignment No.	
Date	
Type of Amendment	
Reason for Amendment	
Alternate Safeguard Procedures	
Required Changes in PPE	

Project Manager Name (Print)

Project Manager Signature

Date

Health & Safety Approver Name
(Print)

Health & Safety Approver Signature

Date

**ATTACHMENT B
TRAINING REQUIREMENTS**

TRAINING REQUIREMENTS
Health and Safety Training Requirements
<p>Personnel will not be permitted to supervise or participate in field activities until they have been trained to a level required by their job function and responsibility. Haley & Aldrich staff members, contractors, subcontractors, and consultants who have the potential to be exposed to contaminated materials or physical hazards must complete the training described in the following sections.</p> <p>The Haley & Aldrich Project Manager/FSM will be responsible for maintaining and providing to the client/site manager documentation of Haley & Aldrich staff members' compliance with required training as requested. Records shall be maintained per OSHA requirements.</p>
40-Hour Health and Safety Training
<p>The 40-Hour Health and Safety Training course provides instruction on the nature of hazardous waste work, protective measures, proper use of personal protective equipment, recognition of signs and symptoms which might indicate exposure to hazardous substances, and decontamination procedures. It is required for all personnel working on-site, such as equipment operators, general laborers, and supervisors, who may be potentially exposed to hazardous substances, health hazards, or safety hazards consistent with 29 CFR 1910.120.</p>
8-hour Annual Refresher Training
<p>Personnel who complete the 40-hour health and safety training are subsequently required to attend an annual 8-hour refresher course to remain current in their training. When required, site personnel must be able to show proof of completion (i.e., certification) at an 8-hour refresher training course within the past 12 months.</p>
8-Hour Supervisor Training
<p>On-site managers and supervisors directly responsible for, or who supervise staff members engaged in hazardous waste operations, should have eight additional hours of Supervisor training in accordance with 29 CFR 1910.120. Supervisor Training includes, but is not limited to, accident reporting/investigation, regulatory compliance, work practice observations, auditing, and emergency response procedures.</p>
Additional Training for Specific Projects
<p>Haley & Aldrich personnel will ensure their personnel have received additional training on specific instrumentation, equipment, confined space entry, construction hazards, etc., as necessary to perform their duties. This specialized training will be provided to personnel before engaging in the specific work activities including:</p> <ul style="list-style-type: none"> • Client specific training or orientation • Competent person excavations • Confined space entry (entrant, supervisor, and attendant) • Heavy equipment including aerial lifts and forklifts • First aid/ CPR • Use of fall protection • Use of nuclear density gauges • Asbestos awareness

**ATTACHMENT C
ROLES AND RESPONSIBILITIES**

SITE ROLES AND RESPONSIBILITIES	
Haley & Aldrich Personnel	
Field Safety Manager (FSM)	<p>The Haley & Aldrich FSM is a full-time Haley & Aldrich staff member, trained as a safety and health professional, who is responsible for the interpretation and approval of this Safety Plan. Modifications to this Safety Plan cannot be undertaken by the PM or the SSO without the approval of the FSM.</p> <p>Specific duties of the FSM include:</p> <ul style="list-style-type: none"> • Approving and amending the Safety Plan for this project • Advising the PM and SHSOs on matter relating to health and safety • Recommending appropriate personal protective equipment (PPE) and air monitoring instrumentation • Maintaining regular contact with the PM and SSO to evaluate the conditions at the property and new information which might require modifications to the HASP and • Reviewing and approving JSAs developed for the site-specific hazards.
Project Manager (PM)	<p>The Haley & Aldrich PM is responsible for ensuring that the requirements of this HASP are implemented at that project location. Some of the PM's specific responsibilities include:</p> <ul style="list-style-type: none"> • Assuring that all personnel to whom this HASP applies have received a copy of it; • Providing the FSM with updated information regarding environmental conditions at the site and the scope of site work; • Providing adequate authority and resources to the on-site SHSO to allow for the successful implementation of all necessary safety procedures; • Supporting the decisions made by the SHSO; • Maintaining regular communications with the SHSO and, if necessary, the FSM; • Coordinating the activities of all subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project; • Providing project scheduling and planning activities; and • Providing guidance to field personnel in the development of appropriate Job Safety Analysis (JSA) relative to the site conditions and hazard assessment.
Site Health & Safety Officer (SHSO)	<p>The SHSO is responsible for field implementation of this HASP and enforcement of safety rules and regulations. SHSO functions may include some or all of the following:</p> <ul style="list-style-type: none"> • Act as Haley & Aldrich's liaison for health and safety issues with client, staff, subcontractors, and agencies. • Verify that utility clearance has been performed by Haley & Aldrich subcontractors. • Oversee day-to-day implementation of the Safety Plan by Haley & Aldrich personnel on site.

- Interact with subcontractor project personnel on health and safety matters.
- Verify use of required PPE as outlined in the safety plan.
- Inspect and maintain Haley & Aldrich safety equipment, including calibration of air monitoring instrumentation used by Haley & Aldrich.
- Perform changes to HASP and document in Appendix A of the HASP as needed and notify appropriate persons of changes.
- Investigate and report on-site accidents and incidents involving Haley & Aldrich and its subcontractors.
- Verify that site personnel are familiar with site safety requirements (e.g., the hospital route and emergency contact numbers).
- Report accidents, injuries, and near misses to the Haley & Aldrich PM and FSM as needed.

The SHSO will conduct initial site safety orientations with site personnel (including subcontractors) and conduct toolbox and safety meetings thereafter with Haley & Aldrich employees and Haley & Aldrich subcontractors at regular intervals and in accordance with Haley & Aldrich policy and contractual obligations. The SHSO will track the attendance of site personnel at Haley & Aldrich orientations, toolbox talks, and safety meetings.

Field Personnel

Haley & Aldrich personnel are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP in its entirety prior to the start of on-site work;
- Submitting a completed Safety Plan Acceptance Form and documentation of medical surveillance and training to the SHSO prior to the start of work;
- Attending the pre-entry briefing prior to beginning on-site work;
- Bringing forth any questions or concerns regarding the content of the Safety Plan to the PM or the SHSO prior to the start of work;
- Stopping work when it is not believed it can be performed safely;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the SHSO;
- Complying with the requirements of this safety plan and the requests of the SHSO; and
- Reviewing the established JSAs for the site-specific hazards on a daily basis and prior to each shift change, if applicable.

Visitors

Authorized visitors (e.g., Client Representatives, Regulators, Haley & Aldrich management staff, etc.) requiring entry to any work location on the site will be briefed by the Site Supervisor on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this safety plan specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these

requirements at all times. Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

SUBCONTRACTOR PERSONNEL

Subcontractor Site Representative

Each contractor and subcontractor shall designate a Contractor Site Representative. The Contractor Site Representative will interface directly with Insert Staff Name Here, the Subcontractor Site Safety Manager, with regards to all areas that relate to this safety plan and safety performance of work conducted by the contractor and/or subcontractor workforce. Contractor Site Representatives for this site are listed in the Contact Summary Table at the beginning of the Safety Plan.

Subcontractor Site Safety Manager

Each contractor / subcontractor will provide a qualified representative who will act as their Site Safety Manager (Sub-SSM). This person will be responsible for the planning, coordination, and safe execution of subcontractor tasks, including preparation of job hazard analyses (JHA), performing daily safety planning, and coordinating directly with the Haley & Aldrich SHSO for other site safety activities. This person will play a lead role in safety planning for Subcontractor tasks, and in ensuring that all their employees and lower tier subcontractors are in adherence with applicable local, state, and/or federal regulations, and/or industry and project specific safety standards or best management practices.

General contractors / subcontractors are responsible for preparing a site-specific HASP and/or other task specific safety documents (e.g., JHAs), which are, at a minimum, in compliance with local, state, and/or federal other regulations, and/or industry and project specific safety standards or best management practices. The contractor(s)/subcontractor(s) safety documentation will be at least as stringent as the health and safety requirements of the Haley & Aldrich Project specific HASP.

Safety requirements include, but are not limited to: legal requirements, contractual obligations and industry best practices. Contractors/subcontractors will identify a site safety representative during times when contractor/subcontractor personnel are on the Site. All contractor/subcontractor personnel will undergo a field safety orientation conducted by the Haley & Aldrich SHSO and/or PM prior to commencing site work activities. All contractors / subcontractors will participate in Haley & Aldrich site safety meetings and their personnel will be subject to training and monitoring requirements identified in this Safety Plan. If the contractors / subcontractors means and methods deviate from the scope of work described in Section 1 of this Safety Plan, the alternate means and methods must be submitted, reviewed and approved by the Haley & Aldrich SHSO and/or PM prior to the commencement of the work task. Once approved by the Haley & Aldrich SHSO and/or PM, the alternate means and methods submittal will be attached to this Safety Plan as an Addendum.

**ATTACHMENT D
JOB SAFETY ANALYSES**



ASTORIA COVE DEVELOPMENT

KEY TASK 1: Waste Characterization

Subtask Category	Potential Hazards	Controls
Drilling	Heavy equipment	<ul style="list-style-type: none"> Personal protective equipment, licensed drill rig operators
Soil Sampling	Slips, trips, and falls	<ul style="list-style-type: none"> Take your time and pay attention to where you are going Adjust your stride to a pace that is suitable for the walking surface and the tasks you are doing Check the work area to identify hazards - beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain Establish and utilize a pathway free of slip and trip hazards Choose a safer walking route. Carry loads you can see over Keep work areas clean and free of clutter Communicate hazards to on-site personnel – remove hazards as appropriate

KEY TASK 2: Remedial Oversight

Subtask Category	Potential Hazards	Controls
Excavation/Trenching	Heavy equipment	<ul style="list-style-type: none"> Personal protective equipment, licensed excavator operators
Excavation Trenching	General site hazards/Slips, trips, and falls	<ul style="list-style-type: none"> See above
Hauling Soils Off-Site	Vehicle traffic/safety	<ul style="list-style-type: none"> Alternate walkways where possible. Use of the local police to direct traffic. Use of an air horn to alert drivers or other workers Maintain good housekeeping and clean the area as work is completed. Use the 'buddy' or 'watchperson' system while performing work Use a spotter for backing, tight maneuvers and bin/tank/equipment drop-offs. Use traffic control devices, field vehicles and barricades and avoid the use of caution tape. Park all vehicles (with wheels in a safe direction away from fieldwork) to block traffic with a flashing yellow light. Also, park so that access to the vehicle is away from oncoming traffic while you are working. When parking a vehicle and equipment utilized a 'first move forward' driving practice. Work in an upright position, facing traffic when possible. Make eye contact with vehicle drivers so that they can recognize your presence.

		<ul style="list-style-type: none"> Minimize work time in traffic. Establish a 'Stop Work' hand signal.
Hauling Soils Off-Site	General site hazards/Slips, trips, and falls	<ul style="list-style-type: none"> See above
Mini/Micro Piles	Noise reduction	<p>Administrative measures include:</p> <ul style="list-style-type: none"> identifying hearing protection zones and clearly sign-posting noisy areas increasing the distance between noise sources and workers the further away the noise source is, the less harmful its effect on workers will be minimizing the number of individuals working in a noisy area keeping individuals out of the area if their job does not require them to be there providing rest breaks in areas away from a noisy work environment providing sufficient information, instructions and training to the workers for the proper use of work equipment. <p>PPE Measures include:</p> <ul style="list-style-type: none"> Wear hearing protection while drilling in progress.
Mini/Micro Piles	General site hazards/Slips, trips, and falls	<ul style="list-style-type: none"> See above
KEY TASK 3: Endpoint Sampling		
Subtask Category	Potential Hazards	Controls
Soil Sampling	Lifting	<ul style="list-style-type: none"> You know where you are going The area around the load is clear of obstacles Doors are open and there is nothing on the floor that could trip someone or make them slip You have a good grip on the load Your hands, the load and any handles are not slippery If you are lifting with someone else, both of you know what you are doing before you start <p>You should adopt the following technique when lifting the load:</p> <ul style="list-style-type: none"> Put your feet around the load and your body over it (if this is not feasible, try to keep your body as close possible to the load and in front of it) Use the muscles of your legs when lifting Keep your back straight Pull the load as close as possible to your body Lift and carry the load with straight arms.
Soil Sampling	General site hazards/Slips, trips, and falls	<ul style="list-style-type: none"> See above
Soil Sampling	Heavy Equipment	<ul style="list-style-type: none"> See above

APPENDIX H
NYSDOH CAMP Guidance Document

Appendix 1A

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 $150 \text{ mcg}/\text{m}^3$ 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 $150 \text{ mcg}/\text{m}^3$ 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 $150 \text{ mcg}/\text{m}^3$ 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.

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Appendix 1B

Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM₁₀) with the following minimum performance standards:
 - (a) Objects to be measured: Dust, mists or aerosols;
 - (b) Measurement Ranges: 0.001 to 400 mg/m³ (1 to 400,000 :ug/m³);
 - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m³ for one second averaging; and +/- 1.5 g/m³ for sixty second averaging;
 - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
 - (e) Resolution: 0.1% of reading or 1g/m³, whichever is larger;
 - (f) Particle Size Range of Maximum Response: 0.1-10;
 - (g) Total Number of Data Points in Memory: 10,000;
 - (h) Logged Data: Each data point with average concentration, time/date and data point number
 - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
 - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
 - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
 - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
 - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m³ (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m³, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m³ above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m³ continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM₁₀ at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- (a) Applying water on haul roads;
- (b) Wetting equipment and excavation faces;
- (c) Spraying water on buckets during excavation and dumping;
- (d) Hauling materials in properly tarped or watertight containers;
- (e) Restricting vehicle speeds to 10 mph;
- (f) Covering excavated areas and material after excavation activity ceases; and
- (g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m³ action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX I
Fish And Wildlife Analysis Decision Key

Appendix 3C Fish and Wildlife Resources Impact Analysis Decision Key		If YES Go to:	If NO Go to:
1.	Is the site or area of concern a discharge or spill event?	13	2
2.	Is the site or area of concern a point source of contamination to the groundwater which will be prevented from discharging to surface water? Soil contamination is not widespread, or if widespread, is confined under buildings and paved areas.	13	3
3.	Is the site and all adjacent property a developed area with buildings, paved surfaces and little or no vegetation?	4	9
4.	Does the site contain habitat of an endangered, threatened or special concern species?	Section 3.10.1	5
5.	Has the contamination gone off-site?	6	14
6.	Is there any discharge or erosion of contamination to surface water or the potential for discharge or erosion of contamination?	7	14
7.	Are the site contaminants PCBs, pesticides or other persistent, bioaccumulable substances?	Section 3.10.1	8
8.	Does contamination exist at concentrations that could exceed ecological impact SCGs or be toxic to aquatic life if discharged to surface water?	Section 3.10.1	14
9.	Does the site or any adjacent or downgradient property contain any of the following resources? i. Any endangered, threatened or special concern species or rare plants or their habitat ii. Any DEC designated significant habitats or rare NYS Ecological Communities iii. Tidal or freshwater wetlands iv. Stream, creek or river v. Pond, lake, lagoon vi. Drainage ditch or channel vii. Other surface water feature viii. Other marine or freshwater habitat ix. Forest x. Grassland or grassy field xi. Parkland or woodland xii. Shrubby area xiii. Urban wildlife habitat xiv. Other terrestrial habitat	11	10
10.	Is the lack of resources due to the contamination?	3.10.1	14
11.	Is the contamination a localized source which has not migrated and will not migrate from the source to impact any on-site or off-site resources?	14	12
12.	Does the site have widespread surface soil contamination that is not confined under and around buildings or paved areas?	Section 3.10.1	12
13.	Does the contamination at the site or area of concern have the potential to migrate to, erode into or otherwise impact any on-site or off-site habitat of endangered, threatened or special concern species or other fish and wildlife resource? (See #9 for list of potential resources. Contact DEC for information regarding endangered species.)	Section 3.10.1	14
14.	No Fish and Wildlife Resources Impact Analysis needed.		