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Remedial Action Work Plan

For:
252 Third Avenue
NYSDEC BCP Site No. C231154
Block 876, Lots 25, 26, 29-32
New York, NY 10010

Prepared for:

Gramercy 252 Owner LLC

SESI Project No:
13542

Date:
June 2025

CERTIFICATIONS

I, Fuad Dahan, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10)

FUAD JEBRAN DAHAN
090531-01

Fuad Dahan	7/1/2025	
NYS Professional Engineer (# 090531)	Date	Signature

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LIST OF ACRONYMS

Acronym	Definition
ACM	Asbestos-containing Material
AWQS	Ambient Water Quality Standards
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CAMP	Community Air Monitoring Plan
COC	Certificate of Completion
CPP	Citizens Participation Plan
CSM	Conceptual Site Model
CVOC	Chlorinated Volatile Organic Compound
cy	Cubic yard
DER	Division of Environmental Remediation
DER-10	NYSDEC Technical Guidance for Site Investigation & Remediation
ECs	Engineering Controls
EE	Environmental Easement
ESA	Environmental Site Assessment
FER	Final Engineering Report
ft-bgs	feet below ground surface
HASP	Health and Safety Plan
ICs	Institutional Controls
ISCO	In Situ Chemical Oxidation
LBP	Lead-based Paint
LNAPL	Light Non-Aqueous Phase Liquid
MW	Monitoring Well
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PDI	Pre-Design Investigation
PFAS	Per and Polyfluoroalkyl Substances
PGSCO	Protection of Groundwater Soil Cleanup Objectives
PPE	Personal Protective Equipment
PRR	Periodic Review Report

Acronym	Definition
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
RSCO	Residential Soil Cleanup Objective
RRSCO	Restricted Residential Soil Cleanup Objectives
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objectives
SESI	SESI Consulting Engineers, DPC
SESC	Soil Erosion And Sediment Control
SMP	Site Management Plan
SOE	Support of Excavation
SoMP	Soil/Materials Management Plan
SSDS	Sub-slab Depressurization System
SWPPP	Stormwater Pollution Prevention Plan
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TOGS	Technical and Operations Guidance Series
UUSCO	Unrestricted Use Soil Cleanup Objectives
UST	Underground Storage Tank
VI	Vapor Intrusion
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

Gramercy 252 Owner LLC (the “Volunteer”) entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) to investigate and remediate the 252 Third Avenue Site in Manhattan, New York (herein referred to as the “Site”) (**Figure 1.1**). The Volunteer entered into BCA Index No C231154-01-23, with an effective date of April 7, 2023 for a 0.16 acre site that consisted of Block 876 Lots 29, 30, 31 and 32. The BCA was later amended February 19, 2025 to include Lots 25 and 26. The total Site is approximately 0.32 acres in size.

This Remedial Action Work Plan (RAWP) presents the data and findings from the remedial investigation and includes an analysis of the potential remedial actions to address the contamination as determined during the Remedial Investigation. Based on the analysis of the remedial investigation data, a Track 1 remedy has been selected by the Volunteer as the preferred remedial alternative. This RAWP will detail the actions to achieve a Track 1 remedy.

Even though a Track 1 remedy has been selected by the Volunteer as the preferred remedial alternative, to the extent this most stringent remedy cannot be achieved, this RAWP will also include an analysis of a Track 2 remedy as a contingency if the Track 1 is not achieved.

1.1 SITE LOCATION AND DESCRIPTION

The Site consists of six (6) contiguous parcels in the Gramercy Park section of New York City that are identified on local tax maps as Block 876, Lots 25, 26, 29, 30, 31 and 32 and total approximately 0.32 acres. Each lot is improved with either commercial storefronts or residential apartment buildings. The Site was developed prior to 1903 and is in a residential and commercial area. A Site Location Map is presented as **Figure 1.1**.

The Site is currently located in the C1-9A zoning district. The Site is bound by E 21st Street and residential apartment to the north, Gramercy Park E and Gramercy Park to the west, residential apartments to the south, and 3rd Avenue east with commercial, residential and retail beyond. A Site Plan is presented as **Figure 1.2**.

1.2 PROPOSED REDEVELOPMENT PLAN

The planned redevelopment of the Site includes the construction of an up to twenty (20)-story building containing residential and commercial uses, parking and a basement level. The proposed development will have an approximately 13,750 square foot (sf) footprint. The footprint of the proposed development is presented as **Figure 1.3** and conceptual redevelopment plans are included as **Appendix A.**

1.3 SITE HISTORY

According to BCP documents prepared by others, the six (6) lots have been developed since the early 1900s and have been used for a variety of purposes, summarized by lot below.

- Lot 25 (37 Gramercy Park East) has been used for residential uses and this lot is currently vacant.
- Lot 26 (38 Gramercy Park North) has been used for residential and commercial uses and is also currently vacant.
- Lot 29 (258 Third Avenue) has been occupied by mixed-use residential and commercial tenants including, a grocery store, café, coffee shop, nail salon and residential use; however, the most significant past use was a dry cleaner between 1956 and 1995. This lot is currently vacant.
- Lot 30 (256 Third Avenue) has been occupied by a restaurant/bar and other commercial and residential and tenants. This lot is currently vacant.
- Lot 31 (254 Third Avenue) has been occupied by various commercial uses and residential tenants. This site also had various chemical and cleaning materials operations, as well as a laundry and dry cleaning store. This lot is currently vacant.
- Lot 32 (252 Third Avenue) has been occupied by various commercial and manufacturing uses, as well as residential units. This lot is currently vacant.

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

RI field activities were completed in August 2023 (AKRF), June and July 2024 and in March 2025. The RI consisted of installation and sampling of 16 monitoring wells (RI-MW1 through RI-MW16), 24 soil borings (RI-SB-1 to RI-SB-24) (three soil borings were completed by AKRF: RI-SB-02, RI-SB-05, RI-SB-06), three (3) soil vapor points were completed by AKRF (RI-SV-1 to RI-SV-3), six (6) sub-slab vapor samples and six (6) indoor air samples. **Figure 2.1** presents all of the sampling locations. **Figures 2.2, 2.3** and **2.4** present the sampling locations and analytical results for soil, groundwater and soil vapor, respectively. AKRF sample locations and results are summarized in the October 2023 Interim Remedial Measures Workplan and the January 2024 Supplemental Interim Remedial Measures Workplan. The AKRF data is included on **Figures 2.2 and 2.4.** The draft RIR was submitted to NYSDEC in April 2025.

For purposes of evaluating the remedial alternatives associated with the proposed Site redevelopment, the analytical results of the soil samples were compared to the NYSDEC 6 New York Code of Rules and Regulations (NYCRR) Part 375 Track 1 Unrestricted Soil Cleanup Objectives (UUSCOs). The constituent concentrations in groundwater were compared to the applicable 6 NYCRR Part 703 AWQS and Technical and Operational Guidance Series (TOGS) 1.1.1.

2.1 SUMMARY OF SOIL REMEDIAL INVESTIGATION FINDINGS

Volatile organic compound (VOC) impacts in soil exceeding UUSCOs were identified throughout the Site and included VOCs, semi-volatile organic compound (SVOCs), pesticides and metals. SVOCs, pesticides and metals are well distributed throughout the Site, while the VOCs, specifically chlorinated compounds, are concentrated in the western portion of Lot 29. VOCs range in depth from 8 ft-bgs to 21.5 ft-bgs. SVOCs, pesticides and metals have been identified between 0.5 ft-bgs and 20.5 ft-bgs. Polychlorinated Biphenyl (PCB) and per and polyfluoroalkyl substances (PFAS) exceedances were not identified. The sampling location plan and contaminant distribution in soil are presented on **Figure 2.2**.

2.2 GROUNDWATER REMEDIAL INVESTIGATION RESULTS

In late June and early July 2024, eleven monitoring wells (RI-MW-1 through RI-MW-11) were sampled for TCL/TAL+30 (including VOCs, SVOCs, PCBs, pesticides, and metals), PFAS, and 1,4-dioxane. Then in March 2025, five (5) monitoring wells (MW-12 through MW-16) were sampled for the same parameters listed above. Site groundwater is impacted by VOCs, SVOCs, metals, PFAS and pesticides above the Ambient Water Quality Standards (AWQS) across the entire Site, again, with the most significant exceedances being the compounds related to chlorinated solvents in the northern and central portion of the Site. The groundwater sample locations and concentrations are presented on **Figure 2.3.**

2.3 SOIL VAPOR REMEDIAL INVESTIGATION RESULTS

Several chlorinated VOCs and petroleum hydrocarbons (PHCs) were detected in soil vapor. VOCs were detected in all soil vapor, sub-slab and indoor air samples. NYSDEC does not have standards for soil vapor, but detections for sub-slab and indoor air samples were compared to the New York State Department of Health (NYSDOH) Screening matrix. The soil vapor sample locations and concentrations are presented on **Figure 2.4.**

2.4 GEOLOGICAL AND HYDROGEOLOGICAL CONDITIONS

Regional surface topography slopes downward to the southeast. Based on the Phase I ESA conducted by SESI Consulting Engineers, the property is approximately 29 feet above the North American Datum. Based on investigations conducted by SESI Consulting Engineers, the soil conditions observed below the basement level consisted of fill material, a layer of native material and then bedrock. The fill material, composed of a mixture of gravel, sand, silt, clay, brick and concrete, was observed to be about 2 to 5 feet thick. The native soils, consisting of a layer of coarse to fine sand with varying amounts of silt and gravel, followed by a layer of fine material composed of silty clay and/or clayey silt, were observed to be about 15 to 25 feet thick. Bedrock was observed between approximately 20 and 30 ft-bgs. The groundwater encountered at the Site was approximately 15-20 ft-bgs across the Site. Relative groundwater elevations have been measured and contours generated (**Figure 2.5**). Based on these approximate elevations, groundwater is anticipated to follow the topography and should flow to the east to the East River. Bedrock geology observed in rock cores was described as gray Schist.

2.5 CONCEPTUAL SITE MODEL

The following subsections present the Conceptual Site Model (CSM) for the Site and discuss the potential sources of contamination, types of contaminants and affected media, potential contaminant pathways and actual/potential human and environmental receptors.

As reported in the Phase I and Phase II ESAs prepared for the Site, the suspected sources of discharge at the Site are primarily related to historical Site operations (i.e., former dry cleaner at

Lot 29) and the chlorinated solvents used in those operations, namely tetrachloroethene and its breakdown products.

The overall depth of impacted soils sampled during the RI ranged from 0.5 to 21.5 ft bgs. The contaminants of concern in soil exceeding either the UUSCOs, Restricted Residential Soil Cleanup Objectives (RRSCOs), and / or Protection of Groundwater Soil Cleanup Objectives (PGSCOs) at the Site consist of VOCs, PAHs, pesticides, and metals. PCBs and PFAS were not identified above the SCOs.

- VOC impacts in soil exceeding UUSCOs, RRSCOs or PGSCOs were identified primarily in the north-central portion of the Site at depths between eight (8) and 21.5 ft bgs. This presents the likely source for VOC impacted groundwater on the Site.
- PAH-contaminated soils exceeding UUSCOs and/or RRSCOs were identified in shallow soils in only two borings.
- Pesticide-contaminated soils exceeding UUSCOs and/or RRSCOs in several samples ranging from one (1) to 20.5 feet bgs.
- Metals contamination exceeding UUSCOs and/or RRSCOs is also well distributed across the Site ranging from 0.5 to 20.5 feet bgs.

Migration pathways include soil contamination leaching from soil to groundwater, however, this is expected to be limited given that the entire site is currently capped, limiting rain water leaching through the soil column. Receptors include humans coming in direct contact with soil.

Site groundwater has been impacted with pesticides, PFAS, SVOCs, metals, and VOCs above the NYSDEC AWQS or the PFAS Guidance Values, with the most significant impacts being the chlorinated solvents.

- VOCs were detected above the AWQS in 12 of the 16 monitoring wells.
- Chlorinated solvents levels were most prevalent in the northern portion of the Site to the western edge of Lot 29.
- PFAS, metals, and SVOCs were detected above the guidance values and/or AWQS across the entire Site.
- Characterization of the bedrock flow patterns and vertical delineation of groundwater contamination will be completed in future investigations.
- Groundwater is expected to flow to the east towards the East River.

Because groundwater in this area is not used for potable water, the pathway of the contaminated groundwater to human receptors is limited to the ingestion of the groundwater or direct exposure through excavation work. Further, because the nearest surface water is approximately 3500 feet to the east (East River), impacted Site groundwater is not expected to have a pathway to an ecological receptor.

Finally, the PHC VOCs and chlorinated volatile organic compounds (CVOCs) detected in soil vapor can result in soil vapor intrusion into the future on-Site buildings.

2.6 IDENTIFICATION OF STANDARDS, CRITERIA AND GUIDANCE

The following standards and criteria typically will apply to Site Characterizations, Remedial Investigations, remedy selection, underground storage tank closures, remedial actions and Site management activities:

- DER-10 / Technical Guidance for Site Investigation and Remediation
- DER-13 / Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York New York State Department of Environmental Conservation
- 6 NYCRR Part 257 - Air Quality Standards
- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations
- Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (October 1994)
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (Final October 2006; amended May 2017; February 2024)
- 6 NYCRR Part 375 - Regulations Subparts 1, 3 and 6 applicable to the Brownfield Cleanup Program
- Citizen Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook (June 1998)
- USEPA Office of Solid Waste and Emergency Response Directive 9355.047FS Presumptive Remedies: Policy and Procedures (September 1993)
- USEPA Office of Solid Waste and Emergency Response Directive 9355.048FS Presumptive Remedies
- Site Characterization and Technology Selection for CERCLA sites with Volatile Organic Compounds in Soils (September 1993)

- 6 NYCRR Part 612 - Registration of Petroleum Storage Facilities (February 1992)
- 6 NYCRR Part 613 - Handling and Storage of Petroleum (February 1992)
- 6 NYCRR Part 614 - Standards for New and Substantially Modified Petroleum Storage Tanks (February 1992)
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes (November 1998)
- 6 NYCRR Subpart 374-2 - Standards for the Management of Used Oil (November 1998)
- 6 NYCRR 375 Table 375-6.8(a) and Table 375-6.8(b)
- 6 NYCRR Parts 700-706 - Water Quality Standards (June 1998)
- 40 CFR Part 280 - Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
- STARS #1 - Petroleum-Contaminated Soil Guidance Policy
- STARS #2 - Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects
- SPOTS #14 - Site Assessments at Bulk Storage Facilities (August 1994)
- Spill Response Guidance Manual
- Permanent Closure of Petroleum Storage Tanks (July 1988)
- NYSDOH Environmental Health Manual CSFP-530 - “Individual Water Supplies - Activated Carbon Treatment Systems”
- 40 CFR Part 144 - Underground Injection Control Program
- 10 NYCRR Part 67 – Lead
- 12 NYCRR Part 56 - Industrial Code Rule 56 (Asbestos)
- 6 NYCRR Part 175 - Special Licenses and Permits--Definitions and Uniform Procedures
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes (November 1998)
- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (November 1998)
- 6 NYCRR Subpart 374-1 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (November 1998)
- 6 NYCRR Subpart 374-3 - Standards for Universal Waste (November 1998)
- TAGM 4013 - Emergency Hazardous Waste Drum Removal/ Surficial Cleanup Procedures (March 1996)

- TAGM 4059 - Making Changes to Selected Remedies (May 1998)
- TOGS 1.3.8 - New Discharges to Publicly Owned Treatment Works
- TOGS 2.1.2 - Underground Injection/Recirculation (UIR) at Groundwater Remediation Sites
- OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (November 1997)
- CP-43: Groundwater Monitoring Well Decommissioning Policy (November 2009)
- NYSDEC Sampling, Analysis, and Assessment of Per-and-Polyfluoroalkyl Substances Guidance Document (latest draft April 2023).
- Green and Sustainable Remediation Guidance and DER 31: Green Remediation

2.7 ENVIRONMENTAL AND PUBLIC HEALTH ASSESSMENTS

2.7.1 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

This exposure assessment discusses potential exposure pathways by which chemicals in the environment may be able to reach human receptors in accordance with NYSDEC DER-10 sections 3.14(c)17, 3.3(c)4 and Appendix 3B. This discussion is based on current and hypothetical future Site conditions and addresses the following four (4) points:

- identifies areas of concern and chemicals of concern;
- evaluates actual or potential exposure pathways;
- characterizes the potentially exposed receptors (residents, workers, recreational users, etc.), and
- identifies how any unacceptable exposures might be eliminated/mitigated.

2.7.1.1 AREAS OF CONCERN AND CHEMICALS OF CONCERN

Findings from the remedial investigation at the Site indicate:

- VOC impacts in soil exceeding UUSCOs and/or RRSCOs were identified primarily in the north-central portion of the Site at depths between eight (8) and 21.5 ft bgs. VOC contamination is believed to be the result of the former dry cleaner on Lot 29.
- Pesticides, metals and SVOCs in soil are expected to be related to background conditions or fill material.
- The primary contaminants identified in groundwater are related to the chlorinated solvents that are due to former dry cleaning operations.
- PFAS, pesticides, metals and SVOCs identified in groundwater are expected to be due to

background conditions and / or historic fill.

- Sub slab and indoor air exceedances are due to the chlorinated solvents that were discharged during the past dry cleaning operations.

2.7.1.2 ACTUAL AND POTENTIAL EXPOSURE PATHWAYS

The five (5) elements that comprise an exposure pathway include:

1. A description of the contaminant source. If the original source is unknown, then a description of the contaminated environmental medium at the point of exposure;
2. An explanation of the transport mechanism;
3. An identification of all potential exposure points;
4. A description of the exposure route at the contact point; and
5. A receptor population.

As noted in the CSM, the contaminant source includes historical Site operations and chlorinated solvents used in the dry cleaning process, as well as contaminated fill. Transport mechanisms, exposure routes and contact points, and potential receptors for each medium are discussed below.

Soil

Impacted soils could potentially be transported from the Site through dust, surface water and sediment runoff, and leaching to the groundwater. Dust and direct contact could create potential exposure points to human receptors through inhalation, ingestion and dermal contact during demolition and construction activities as well as unauthorized access to the Site. Leaching to groundwater could create a pathway to potential users of groundwater.

Groundwater

Contamination in groundwater could be transported via groundwater flow or inhalation of vapors. Human receptors could be exposed to impacted groundwater through direct ingestion or adsorption during excavation work or ingestion of impacted potable water.

Surface Water and Sediment

Surface water is not present on the Site. Thus, this exposure pathway may be eliminated from further evaluation.

Soil Vapor and Indoor Air

The potential for vapor contamination to migrate exists whenever near contaminants volatize, and this is enhanced during intrusive activities such as demolition and excavation. The exposure route for soil vapor is through the inhalation of the contaminated soil vapor during intrusive construction activities or when vapors intrude into the enclosed spaces of any planned Site development. After the Site is redeveloped, a potential that vapors could accumulate in enclosed areas of the proposed building, such as basements, crawl spaces, first floors, etc. create potential exposure points.

2.7.1.3 ELIMINATION OR MITIGATION OF UNACCEPTABLE EXPOSURES

The following sections set forth the measures to be undertaken to eliminate or mitigate the potential risks of exposure for each medium. The remedies to be employed to reduce/eliminate the exposure risks will be detailed in the Remedial Action Work Plan (RAWP) that will be prepared for the Site.

Soil

At present, potential exposure points have been eliminated by restricting public access to the Site; the Site is nearly entirely covered by buildings and access to the buildings is restricted. Further, the buildings are vacant. During future construction activities, specifically disturbance of soils, the potential for exposures to soils would increase for on-Site workers, utility workers, visitors and trespassers, as well as disturbed soils migrating offsite. These risks will be mitigated by employing the proper personal protective equipment (PPE), implementing the Health and Safety Plan and CAMP, preventing dust generation and implementing Site security to restrict access and managing soil runoff by implementing stormwater control measures. Future exposure to soil contamination, impact to groundwater and soil vapors will be mitigated/eliminated due to the removal and/or removing the potential exposure pathway by implementing engineering controls such as a site cover system and soil vapor mitigation system.

Groundwater

To mitigate exposure risks during remediation and construction, the proper PPE will be employed and groundwater that is encountered during excavations will be dewatered and managed to minimize direct contact. The groundwater removed from the excavation will be treated and disposed of properly off-Site to the New York City combined sewer system under the appropriate permit, mitigating potential groundwater exposure pathways.

Further impacts to groundwater due to contact with soil contamination will be eliminated when the remediation is conducted, and the impacted soil is removed. As part of the remediation of the Site, it is anticipated that groundwater will be remediated, and residual groundwater contamination, to the extent remaining, will naturally attenuate with time, reducing the risk of human heath exposure. The potential for exposure to impacted groundwater is also mitigated by the fact that groundwater in this area is not used for potable purposes.

Soil Vapor and Indoor Air

As with soil and groundwater, potential exposure to soil vapor during construction will be minimized through the use of proper PPE and continuous air monitoring to ensure acceptable levels of airborne contaminants and dust. The planned soil excavation is expected to address future exposure risk to soil vapor and indoor air; however, an assessment of indoor air will be conducted post-construction to ensure there are no vapor intrusion issues in the future structures on the Site.

2.7.2 FISH AND WILDLIFE IMPACT ANALYSIS

The Fish and Wildlife Resources Impact Analysis Decision Key (NYSDEC, 2010; DER-10 Appendix 3C) was utilized to evaluate the Site for potential fish and wildlife impacts. The result of the assessment determined that the Site does not contain any ecologically sensitive resources and hence the contaminated soils are not expected to have any impacts on any ecological resources.

2.8 SIGNIFICANT THREAT

The Site was determined to be a Positive Significant Threat on November 9, 2023.

2.9 REMEDIAL ACTION OBJECTIVES

Based on the results of the Remedial Investigation, the following Remedial Action Objectives (RAOs) have been identified for this Site.

2.9.1 GROUNDWATER

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

2.9.2 SOIL

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in (include all appropriate media: groundwater, surface water, or sediment) contamination.

2.9.3 SOIL VAPOR

RAOs for Public Health Protection

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

2.10 GREEN SUSTAINABLE REMEDIATION

During the course of the remedial action field activities, SESI will consider NYSDEC DER-31 “Green Remediation” implementation objectives. DER-31: Green Remediation provides the framework for DER's approach to remediating sites in the context of the larger environment, a concept known as “Green Remediation”. Green Remediation (or greener cleanups) can be defined as “the practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprint of cleanup actions.” It is intended to be a holistic approach which improves the overall sustainability of remedial cleanups by promoting the use of more sustainable practices and technologies. Such practices and technologies are less disruptive to the environment, generate less waste, increase reuse and recycling, and emit fewer pollutants, including greenhouse gases (GHGs), to the atmosphere. The approach also recognizes the potential for positive economic and social benefits of site reuse and supports coordination of site reuse and remediation to affect the most beneficial and sustainable reuse of the site. Please note that final end use is dictated by local zoning codes. DEC’s role is to ensure that the remedy is protective for the intended end use. Green Remediation concepts and techniques considered during the remedial activities will include:

- Require a Green Remediation Implementation Plan submittal from the selected Contractor to detail procedures and tracking of these items;
- During construction activities and associated landscape alteration activities, green building strategies such as those outlined in the USGBC LEED should be considered;
- LEED includes guidelines and recommendations for new construction, and existing building operations and management that fall under six categories important for reducing the environmental impact of facilities of all types:
    - Sustainable sites
    - Water efficiency
    - Energy and atmosphere
    - Materials and resources
    - Indoor environmental quality
    - Innovation in operations
- As noted across the LEED categories, resources other than energy that can be conserved include water, raw materials for materials consumed, topsoil, paper for reports, and landfill space. Conserving one resource typically conserves other resources and has other sustainability benefits. For example, recycling of construction and demolition debris or metal will reduce consumption of landfill space and may also save energy and reduce air emissions by reducing material transportation. Another example is the use of waste-to energy plants for waste disposal rather than landfills in states where these plants are currently operating. This also reduces the consumption of landfill space and results in energy production from the waste processing. Other examples of resource conservation include treated water reinjection, the reuse of treated soil onsite, and the beneficial reuse of sediments.
- The use of “green” construction and project management products and materials such as ecofriendly concrete or the use of native plants for site restoration also advances the sustainability objectives of the project. It is important to understand that green remediation implies minimizing the entire footprint of the remediation project, which includes the environmental impacts of products and materials associated with the project. For example, eco-friendly concrete generally refers to concrete that is produced with a certain percentage of fly-ash (a waste product from the coal-firing process). This type of “green” concrete takes a problematic substance out of the waste stream and reduces the

cumulative amount of energy associated with the production of concrete. The use of native plants for site restoration helps to conserve water and eliminate the need for potentially harmful fertilizers and pesticides.

Other approaches or considerations may be approved by NYSDEC on a case-by-case basis.

- Prohibiting idling vehicles and equipment when possible to reduce emission of CO2, N2O, CH4, and other greenhouse gases contributing to climate change;
- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term when choosing a site remedy;
- Reducing direct and indirect green house gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development;
- Implementing the use of particulate detectors to monitor and minimize dust export of contaminants;
- Implementing the use of VOC detectors to monitor and minimize VOC exposures; and
- Coordinating sampling events to maximize on-site efforts while minimizing travel to/from the Site (economy of scale implementing multiple sampling events).

2.11 CLIMATE CHANGE VULNERABILITY ASSESSMENT

The Climate Change Vulnerability Assessment considers the Site remedies climate resiliency and considers the proposed remedy’s vulnerability to climate change. The first step is to conduct a climate screening.

- The climate screening is a high level desktop review of the site and potential changes in climate hazards. If the screening identifies potential exposure to climate hazards, a Climate Vulnerability Assessment (CVA) will need to be conducted. A CVA will identify adaptation measures to account for projected climate hazard exposures.
- For sites susceptible to climate change, require a Climate Adaptation Plan, which will incorporate findings and recommendations from the Climate Vulnerability Assessment.

- Consideration of the Site Elevation, Clim AID Region, Remedial Stage/site classification, Contamination, Proposed/Current Remedy, proximity to any sensitive receptors, whether the Site is in a disadvantaged community (DAC) or potential environmental justice area and remediation timeframe; and
- The relevance to the Site and the Remedy of Precipitation, Extreme Heat or Cold, Sea Level Rise, Flooding, Storm Surge, Wildfire, Drought, Storm Severity, Landslides and other hazards.

If potential impacts from climate hazards are identified, a climate vulnerability assessment must be conducted. This Climate Change Vulnerability Assessment should consider the reliability of energy, potential for flooding/droughts, increased erosion potential, proximity to water bodies, and any other environmental factors subject to change. If already completed in a previous phase, the Climate Change Vulnerability Assessment should be updated as necessary throughout the environmental cleanup.

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

3.1 EVALUATION OF REMEDIAL ALTERNATIVES

The objective of the remedy is to achieve a cleanup that is the most protective of human health and the environment and that does not rely on ECs or ICs. This objective will most likely be accomplished by a Track 1 remedy eliminating the source material and achieving the UUSCO.

If the groundwater or soil vapor will require monitoring or ECs in certain areas of the Site after issuance of the COC, then the remedy would be a conditional Track 1.

Track 1

A remedy pursuant to this track must achieve compliance with the UUSCOs set forth in 6 NYCRR Table 375-6.8(a). In a conditional Track 1 remedy, temporary institutional and engineering controls are allowed only for periods of less than five (5) years. This alternative would involve the complete removal and/or remediation of the soil with exceedances to the UUSCO, which were encountered during the RI to 21.5 ft-bgs across the Site. A feasible remedial technology that may be used to implement this alternative involves the excavation of the contaminated soil to 21.5 ft-bgs and transportation to an approved off-Site facility for disposal. Post-excavation samples will be collected at the target excavation depth. If the confirmation samples result in exceedances of UUSCOs, the excavation will continue until UUSCOs are achieved or until bedrock is encountered whichever is encountered first. Therefore, the planned excavation should be sufficiently deep to fulfill Track 1 remedy requirements for soils and will achieve the Track 2 remedy as a contingency in the event that the excavation for a Track 1 remedy is not feasible.

Temporary institutional and engineering controls may be implemented to address contamination in groundwater and soil vapor for a conditional Track 1 remedy. The proposed groundwater remediation will include the design and implementation of an in-situ treatment of the CVOC contamination. The in-situ remediation will likely include a series of in-situ chemical oxidation (ISCO) injections to destroy the CVOC and achieve the AWQS or significant reductions in contaminant levels. Before the design and implementation of the groundwater treatment, a pre-design investigation (PDI) to characterize the deep groundwater and the deep bedrock geology will be conducted. Five (5) deep wells will be drilled on site and downhole geophysics will be conducted in each well to characterize the deep rock and the fracture zones. The wells will be constructed based on the findings from the downhole geophysics and will be sampled to characterize the groundwater in that zone. The groundwater characterization and the downhole geophysics will assist in designing the in situ remediation strategy for groundwater.

The detailed design of the treatment, which will include the location of the injection points, quantity of ISCO to be injected and injection method, will be provided to NYSDEC and NYSDOH for review and approval prior to implementation. Following remediation, continued periodic monitoring of the contaminant levels in the Site groundwater monitoring wells will constitute an engineering and institutional control until the groundwater levels are below the standards or until they reach asymptotic levels that are accepted by the NYSDEC. If groundwater levels do not reach AWQS or the asymptotic levels are not accepted by the NYSDEC or NYSDOH, then the remedy will be considered a Track 2 remedy as described below.

Due to the elevated levels of chlorinated VOCs (tetrachloroethene [PCE] and trichloroethene [TCE]) in soil vapor, the remedy will include the installation of the elements of an sub-slab depressurization system (SSDS) underneath the building if the sub slab of the proposed building is not totally submerged under the water table during the seasonal low. The design for the proposed buildings has not been completed as of the time of writing this RAWP. Once the building design is completed, the designs for the SSDS piping and the vapor barrier will be developed and will be submitted for NYSDEC and NYSDOH approval.

A soil vapor intrusion evaluation will be completed and if an SSDS is determined to not be needed, then the elements of SSDS will not be considered an EC. If the evaluation determines that an SSDS is needed, then the air blower will be designed and added to the elements of the SSDS, which will become an EC. If, within the five-year period following issuance of the Certificate of Completion (COC), the VOC concentrations in the sub slab and indoor air drop to levels below the mitigate threshold requirements, a recommendation will be submitted to NYSDEC and NYSDOH for their review and approval to shut down the active SSDS. If the recommendation is approved and the SSDS shut down, it will no longer be considered an EC, and the condition on the Track 1 remedy will be removed.

Track 2

Cleanups pursuant to this track may consider the intended future use in determining the appropriate cleanup levels for soil. This track requires the Volunteer implement a cleanup that achieves soil cleanup objectives (SCOs) from tables in 6 NYCRR 375-6.7(b) that is consistent with the intended Site use for the top 15 feet of soil (or bedrock if less than 15 feet). There are two applicable track 2 SCOs – Residential (RSCOs) and Restricted Residential (RRSCOs). The Site remediation pursuant to Track 2 Residential would involve excavation and disposal of the contaminated soils to meet the lower of these two (2) SCOs. Institutional and engineering controls that limit Site use and on-Site groundwater use can be used without regard to duration.

The groundwater remediation would be as described under Track 1. If the active in situ treatment remedy is applied and groundwater concentrations do not meet the AWQS or reach asymptotic levels accepted by the NYSDEC within five (5) years following issuance of the COC, then the groundwater monitoring and wells will be considered a long-term engineering control and the Track 2 Residential remedy will be the fallback contingency.

If the soil vapor levels do not reach the “no action” level as described in the matrices (May 2017) within five (5) years following issuance of the COC, then the SSDS will continue to act as a permanent EC and the remedy will be Track 2 Residential.

If the Track 2 cleanup only achieves the RRSCOs, the Site requires a Site Management Plan (SMP) to ensure that any institutional and engineering controls are maintained, and material removed from the Site (post remedial action) is managed properly.

Track 3

The Track 3 cleanup is not applicable to this Site because the contaminants present on this Site are common and are listed in the SCOs in NYCRR 375-6.8(b) tables.

Track 4

A Track 4 remedy for restricted residential use does not need to meet specific soil cleanup objectives, but requires source removal and typically a Site-wide cover system where, as here, there is Site-wide surficial contamination.

Short- and long-term institutional and engineering controls can achieve protection of public health and the environment. In the event a remedy under Track 4 were to be implemented for this Site, it must provide a cover system over exposed remaining soil contamination. Soils that are not otherwise covered by structures such as buildings, sidewalks or pavement must be covered with two (2) feet of soil that complies with the RSCOs or RRSCOs.

Long-term monitoring of groundwater will continue under a Track 4 residential remedy. An SSDS as an EC will operate to mitigate any vapor intrusion risk resulting from the VOC.

A Track 4 remedy would also include an SMP to ensure that any institutional and engineering controls are maintained, and that material removed from the site (post remedial action) is managed properly. The SMP would include periodic (annual) monitoring and reporting of the cover system to ensure continued protection of the human health and the environment.

No Action Alternative

The no action alternative would leave existing sources of contamination in soil and groundwater and soil vapor. The no action alternative is thus unacceptable and has not been compared to the factors below.

Protection of human health and the environment:

Although all tracks will provide adequate protection of human health and the environment, the Track 1 remedy would be more protective than the other cleanup tracks because it would remove all soil contamination to achieve the State's most stringent SCOs. This conditional Track 1 remedy may require short-term ongoing temporary institutional and engineering controls to manage the vapor contamination to effectively protect human health and the environment and monitor the degradation of the remediated groundwater. A Track 1 remedy also initially costs more and is less implementable than the Track 2 and 4 remedies. However, a Track 1 remedy can be implemented through the complete removal of all the contaminated soil, and implementation of an in-situ groundwater treatment remedy, which should facilitate the natural attenuation of the remaining groundwater contamination more rapidly than from the other remedies. Moreover, because a Track 1 remedy requires no long-term institutional or engineering controls, it is potentially less costly and more implementable in the long run than remedies that rely on such controls for long-term effectiveness. A Track 2 remedy would also be protective of human health and the environment if the proper long-term engineering and institutional controls are put in place and managed in an SMP. A Track 4 remedy would also be protective of human health and the environment if the proper long-term engineering and institutional controls are put in place and managed in an SMP. However, groundwater and soil vapor would remain contaminated for a longer time.

Compliance with standards, criteria, and guidelines (SCGs):
All cleanup tracks will achieve applicable cleanup standards. A Track 1 remedy achieves a more stringent set of standards than a Track 2 remedy. A Track 4 remedy is not driven by standards but rather by source removal and SMP ECs and ICs to manage the remaining contamination in place to enable the safe reuse of the site for restricted residential purposes.

Short-term effectiveness and impacts:
Generally, a Track 1 remedy provides the best short-term effectiveness because it promptly removes the most contaminant mass from the Site. A Track 2 remedy also accomplishes this, but to a lesser extent. A Track 4 remedy is less effective in this regard. Track 1 and 2 remedies are somewhat less favorable in terms of short-term impacts primarily because mass removal of the contaminated soils generates more truck trips than a Track 4 limited removal remedy. A Track 4 remedy also reduces the risk of construction worker exposure by reducing the volume of contaminated soil being managed and has less potential to cause dust and traffic issues. Excavation may result in a greater potential for migration of impacts from the open excavation (e.g. wind erosion, stormwater intrusion, etc.); however, implementation of the CAMP and erosion and sediment controls will be implemented to minimize and control any migration.

Long-term Effectiveness and Performance:
Because the Track 1 and 2 remedies would involve removal of the greatest amount of contaminated soil, they will provide the most long-term effectiveness. As already discussed above, a Track 1 remedy will allow the Site to be used for any purpose without restriction and without reliance on the long-term employment ICs or ECs (which can fail and require ongoing monitoring and maintenance to remain effective over the long-term). A restricted residential Track 2 remedy allows the Site to be used for almost all possible uses in an urban setting but requires ECs and ICs to ensure there is no exposure to residual contamination.

The long-term effectiveness of the Track 4 remedy will be ensured with adherence to the SMP and recording of an EE. Although contaminants are left on Site, a properly maintained cover system is effective at eliminating the risk of dermal exposure and the planned soil vapor mitigation measures will also help to ensure lack of exposure to any remaining on-Site vapors.

Reduction of toxicity, mobility, or volume of contaminated material:

Track 1, 2 or 4 remedies will reduce toxicity and mobility. A Track 1 or 2 remedy would result in a greater reduction in the volume of contaminated soil than a Track 4 remedy. While a Track 4 remedy provides a relatively smaller reduction in volume than the other tracks, it relies primarily on the decrease of contaminant mobility.

Constructability:

Track 1, 2 and 4 remedies are implementable given the location and the planned use for the Site. While there are short-term potential impacts from each potential remedy, the Site is located in the middle of an urban area, and therefore disposal of the contaminated soil and truck access will not be a problem. Moreover, these short-term impacts will be avoided through implementation of the CAMP and HASP, which will employ truck washing and odor and dust control measures. Therefore, Track 1, 2 or 4 remedies are implementable for this Site.

Cost Effectiveness:

The preferred alternative should provide optimal suitability of the eight (8) accompanying evaluation factors with minimal remedial cost. The contaminated soil extends from the surface to a depth of 21.5 ft-bgs. Removal of all soils containing VOCs, SVOC, pesticide, and metals, exceedances of the UUSCOs to achieve Tracks 1 or 2 Site wide will be more costly than a Track 4 remedy. However, this mass removal results in long-term savings by eliminating (or, in Track 2, significantly reducing) the need for ICs/ECs and the associated ongoing monitoring and maintenance. In addition, a Track 1 or 2 remedy should eliminate any on-Site soil source that may be contributing to soil vapor issues at the Site. Therefore, a Track 1, 2 or 4 remedy for the Site is cost effective.

Dewatering and then the implementation of an in-situ treatment remedy for groundwater will enhance the removal of dissolved CVOCs on the Site. Some cost savings may be derived if the duration of groundwater monitoring is reduced.

Community Acceptance:

A community outreach program has been and will continue to be incorporated into all remedial alternatives, per NYSDEC Brownfield Program law and regulations and through the Citizen Participation Plan (CPP). The community should accept any of the remedies; however, the Track

1 or 2 remedy would be preferable to the community since they would remove the most soil contamination.

Land use:

Track 1 or 2 remedies would allow for the planned residential use of the Site, which is consistent with land uses in the area.

Zoning: All of the proposed remedies under each track will facilitate the Site to be utilized for a proposed mixed-use residential development, which is consistent with applicable zoning laws and anticipated future use of the site.

Applicable comprehensive community master plans or land use plans: Implementation of all tracks (with institutional controls) cleanup will facilitate the proposed mixed-use residential development, which is consistent with the current local land use plan.

Surrounding property uses: Any cleanup approach is not expected to significantly impact land use of the surrounding properties as the truck traffic and access will be on public roads.

Citizen Participation: Citizen Participation during implementation of a remedial program will proceed in accordance with the CPP included as Appendix F of the Remedial Investigation Work Plan (RIWP) and as noted above will have minimal community impact. Any short-term impacts will be addressed by the CAMP and the HASP.

Environmental justice concerns: There are no known environmental justice concerns associated with this project.

Land use designations: A Track 1 remedy will not restrict any current or future land use designations. A restricted residential Track 2 remedy will have very minimal restrictions on the future land use of the property. A Track 4 remedy will have restrictions that will be managed in the SMP and EE.

Population growth patterns: Any of the proposed remedies will not impact reasonably anticipated population growth patterns in the area other than to better accommodate growth by providing for additional housing.

Accessibility to existing infrastructure: Some on-Site old utility infrastructure will likely have to be demolished and removed as part of the remediation. However, new infrastructure will be installed subsequent to the remediation as part of the redevelopment.

Proximity to natural resources: The closest surface water body to the Site is the East River, which is located 0.6 miles to the east of the subject property. Stormwater drainage patterns are generally consistent with the surrounding topography.

<u>Geography and geology of the Site</u>: See Section 1 above.

<u>Current Institutional Controls:</u> There are no current institutional controls associated with the Site.

3.2 SELECTION OF THE PREFERRED METHOD

The remedial alternatives analysis determined that a Track 1 (if achievable) remedy will be the goal for the Site. If Track 1 cannot be achieved due to groundwater or soil vapor conditions, a Track 2 remedy will be achieved.

3.3 SUMMARY OF SELECTED REMEDIAL ACTIONS

A summary of the selected Track 1 or 2 remedial actions to address the impacts identified are discussed below:

1 Site preparation, including asbestos and lead based paint abatement, demolition of the existing buildings, and installation of a dewatering system for the deep remedial excavation and support of excavation (SOE) system along the sidewalls of the entire Site to facilitate the remedial excavation, support adjoining structures during remedial excavation and prevent off-Site migration of contaminants.

2 Excavation and off-site disposal of contaminated soils to achieve UUSCOs. Endpoint confirmatory samples will be collected, if bedrock is not encountered during the excavation, to prove Track 1 was achieved. Sidewall sampling, when applicable, will be implemented to document any remaining contamination in the sidewalls at the property boundary or deeper excavations. The excavation will continue in 2-foot lifts, with confirmation samples collected every 1-foot of additional excavation depth, until the confirmatory samples have proven that the soils have achieved UUSCOs or bedrock is encountered. If bedrock is encountered before clean end point samples are collected, the remediation will be documented with photographs and survey of the rock at that point.

3 Documentation of all appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal.

4 Treatment of contaminated groundwater during excavation activities through an on-Site dewatering system.

5 Further characterization of the deep groundwater zone within the bedrock layer to develop an in-situ chemical oxidation treatment to reduce the groundwater contamination levels below the AWQS or achieve significant reduction of the

groundwater contaminant concentration to asymptotic levels that are accepted by the NYSDEC and NYSDOH.

6 Installation of the elements of an SSDS underneath the building foundation if the sub-slab of the proposed building is not under the water table during the seasonal low. A soil vapor intrusion evaluation will be conducted, when the construction of the proposed building is completed after the COC, to determine if the soil vapor (SV) levels constitute a vapor intrusion (VI) risk. The elements of the SSDS will be turned into engineering control (EC) as an active SSDS if the soil vapor evaluation determines that vapor mitigation is needed.
7 Installation of a 20-MIL sealing vapor barrier in the proposed building.
8 Recording of an Environmental Easement (EE) for the entire Site for groundwater monitoring and the SVI evaluation. The EE will remain effective until any required ECs and Institutional Controls (ICs) are removed if an unconditional Track 1 remedy is accomplished within five (5) years. If the unconditional Track 1 remedy is not achieved in this timeframe as a result of any remaining on-Site conditions that do not meet the BCP Track 1 requirements, the EE will continue under a Track 2 remedy for any residual groundwater and soil vapor contamination provided the vapor on Site is not still emanating from an off-site source.
9 Preparation of an SMP, for the conditional Track 1 remedy or Track 2 alternative remedy, for short-term management of residual contamination as required by the Environmental Easement, particularly as they pertain to future phases of construction, including plans for: (1) Institutional and Engineering Controls, (2) groundwater and soil vapor monitoring, and (3) reporting. Additional groundwater treatment, such as injections, if needed, will be conducted under the SMP if groundwater levels did not achieve the AWQS or asymptotic levels that are accepted by the NYSDEC and NYSDOH.
10 Import of backfill materials, if needed, during redevelopment construction activities, to be used for backfilling and soil cover, if necessary, must be in compliance with: (1) chemical limits and other specifications included in NYCRR Sections 375-6.7(d) and 375-6.8 (b) and DER-10 (2) all Federal, State, local rules and regulations and site-specific approvals for handling/reuse and transport of material.
11 All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with

all applicable Federal, State and local rules and regulations and overseen and certified by the SESI Remedial Engineer of Record described below.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP. All deviations from the RAWP will be promptly reported to NYSDEC for approval and fully explained in the Final Engineering Report (FER).

4.0 REMEDIAL ACTION PROGRAM

4.1 GOVERNING DOCUMENTS

4.1.1 SITE-SPECIFIC HEALTH AND SAFETY PLAN

A copy of the SESI HASP is included as **Appendix B**. All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal OSHA.

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

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

4.1.2 QUALITY ASSURANCE PROJECT PLAN (QAPP)

A copy of SESI QAPP is included as **Appendix C**. All field sampling procedures and analytical methods will be implemented in accordance with this QAPP.

4.1.3 SOIL/MATERIALS MANAGEMENT PLAN (SoMP)

The SoMP is included as Section 5.12 and includes detailed plans for managing all soils/materials that are disturbed at the Site, including excavation, handling, storage, transport and disposal. It also includes all of the controls that will be applied to these efforts to ensure effective, nuisance-free performance in compliance with all applicable Federal, State and local laws and regulations.

4.1.4 SOIL EROSION AND SEDIMENT CONTROL (SESC) PLAN

A soil erosion and sediment control plan will be prepared prior to start of remediation or construction work. The SESC will address requirements of the New York State Stormwater Management Regulations including physical methods to control and/or divert surface water flows and to limit the potential for erosion and migration of Site soils, via wind or water.

4.1.5 COMMUNITY AIR MONITORING PLAN

A copy of the CAMP for the Site is included as **Appendix D**.

4.2 GENERAL REMEDIAL CONSTRUCTION INFORMATION

4.2.1 PROJECT ORGANIZATION

Gramercy 252 Owner LLC is the BCP Volunteer and redeveloper of the Site. SESI is the environmental consultant for the Volunteer. A table summarizing the various personnel associated with the project is included as **Table 4.1** below.

Table 4.1 – Project Personnel

Name	Company	Project Position	Address	Phone Number
Dory Goudsmit	Gramercy 252 Owner LLC	Volunteer Contacts	75 Rockefeller Plaza, Floor 17 New York, NY 10019	(212) 317-1700
James Vander Vliet, PE	SESI Consulting Engineers, P.C.	Environmental Consultant's Project Manager	959 Rt 46 East, Parsippany, NJ 07054	(973) 808-9050
Fuad Dahan, PE	SESI Consulting Engineers, P.C.	Remedial Engineer	959 Rt 46 East, Parsippany, NJ 07054	(973) 808-9050
Shawn Roberts	NYSDEC	Project Manager	625 Broadway, Albany, NY 12233	(518) 402-9799

4.2.2 REMEDIAL ENGINEER

The Remedial Engineer for this project will be Fuad Dahan, PE. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the 252 Third Avenue Site (BCP No. C231154). The Remedial Engineer will certify the FER that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the RAWP and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

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

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

4.2.3 REMEDIAL ACTION SCHEDULE

A remedial action schedule is included as **Table 4.2** below. The schedule includes estimates of time required to complete the activities associated with the remedial action. It is based on elapsed time from receipt of NYSDEC approval. Once NYSDEC approves this RAWP, an updated schedule showing actual dates will be provided to the NYSDEC as an addendum to this plan.

Table 4.2 – Remedial Action Schedule

Activity	Date
RIR submission	April 2025
RAWP submission	April 2025
Start of RAWP Public Comment period	June 2025
NYSDEC approves RAWP and issues decision document	August 2025
Site Prep and Remediation	September 2025 – January 2026
Groundwater Treatment	October 2025
Submission of Environmental Easement	February 2026
Submission of SMP	February 2026
Submission of FER	June 2026
Certificate of Completion	August 2026

4.2.4 WORK HOURS

The hours for operation of remedial construction will conform to the Borough of Manhattan construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Applicant of any variances issued by the Department of Buildings.

4.2.5 SITE SECURITY

The Site will be secured with fences and locked gates.

4.2.6 PRE-CONSTRUCTION MEETING WITH NYSDEC

A pre-construction meeting will be held with NYSDEC prior to the start of major remedial construction activities.

4.2.7 EMERGENCY CONTACT INFORMATION

An emergency contact sheet with names and phone numbers is included in **Table 4.3** below. That document will define the specific project contacts for use by NYSDEC and NYSDOH in case of a day or night emergency.

Table 4.3 - Emergency and Contact Numbers

Medical, Fire, and Police:	911
One Call Center:	(800) 272-4480 (3-day notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362
Fuad Dahan – Remedial Engineer (SESI Consulting Engineers)	(973) 808-9050
Director of Construction	TBD

* Note: Contact numbers subject to change and will be updated as necessary

4.3 SITE PREPARATION

4.3.1 MOBILIZATION

Mobilization tasks will include:

- Asbestos remediation and demolition of existing buildings;
- Construction of temporary facilities and utilities;
- Set-up of construction equipment and facilities;
- Construction of fencing and barriers;
- Construction of erosion control measures; and
- Construction of decontamination and materials staging areas.

4.3.2 WORKER TRAINING AND MONITORING

All on-Site project personnel who work in areas where they may be exposed to Site contaminants must be trained as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER). All SESI project personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in the HASP prior to initiating site activities. In addition, all SESI personnel will attend an initial hazard briefing prior to beginning work at the Site.

All subcontractor personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating Site activities. All subcontractor personnel will attend an initial hazard briefing prior to beginning work at the Site. Additionally, on-Site subcontractor personnel must conduct daily Site safety meetings.

4.3.3 TRAFFIC CONTROL

Traffic control shall be the responsibility of the Volunteer its contractors. Traffic control must comply with all local, state, and federal regulations including but not limited to New York City Department of Transportation and the Manual on Uniform Traffic Control Devices.

4.3.4 UTILITY MARKER AND EASEMENTS LAYOUT

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

4.3.5 SUPPORT OF EXCAVATION

Installation of an SOE system will be required to provide structural stability of the remedial soil excavation and to protect surrounding buildings, sidewalks and roadways. The SOE will act as a support for the excavation during the remediation of contaminated soil on Site. Contaminated soil will be disturbed during the installation of the SOE measures. The depth to bedrock has been observed to be approximately 20 to 30 feet below the ground surface, based on geotechnical investigations. The SOE design is expected to include soldier piles and lagging along the street frontage, as well as a secant pile or tangent pile wall along the adjacent properties, with depths varying depending on location and adjacent building load.

4.3.6 SITE PREPARATION DEMOLITION

Site preparation, including building demolition, will take place prior to the start of the soil excavation. Demolition of the existing structures is required to obtain access to the surface and subsurface sufficient to remediate the Site.

The Volunteer will retain a certified professional to perform a pre-demolition asbestos containing material (ACM) and lead-based paint (LBP), and PCB surveys and collect bulk material samples from the Site buildings. A New York State Department of Labor Certified Asbestos Inspector will perform asbestos inspections and collect bulk material samples from suspected ACM identified to be present on the interior and exterior of the Site buildings.

Continuous air monitoring will be conducted for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures, and as a best practice during any demolition. 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 proposed.

The Construction Completion Report (CCR) will include a section to document that building demolition was completed in accordance with all applicable regulations. It will include documentation of asbestos/lead surveys, asbestos and/or lead based paint abatement (as applicable), local demolition permitting, and proper off-site disposal of all materials.

4.3.7 DEWATERING

Dewatering will be required as part of this remedy because groundwater was identified at depths of approximately 17-19 ft-bgs. During the Site remediation, dewatering will be implemented during the excavation work where groundwater is encountered in order to prevent direct contact with the groundwater. The water will be properly contained, treated and disposed off-Site either in the public owned treatment works sewer or shipped to an approved off-Site treatment facility. Further groundwater remediation will aim to mitigate potential groundwater and vapor concerns and try to reduce contamination to levels below the AWQSs through implementation of dewatering and the in situ treatment remedy. Groundwater will be discharged to the New York City combined sewer system in accordance with the Approval to Temporarily Discharge Groundwater into Sewers Dewatering Permit Guidelines.

4.3.8 EQUIPMENT AND MATERIAL STAGING

Equipment and material staging areas are expected to be relocated throughout the Site during remedial construction.

4.3.9 DECONTAMINATION AREA

A tracking pad will be required for any vehicles going off-site that have come in contact with on-Site soils. The decontamination area construction and operational requirements are provided in the HASP. All vehicle tires must be washed before exiting the Site.

4.3.10 SITE FENCING

A construction safety fence will be installed around the entire perimeter of the Site. Access through gates will be provided at various points as required by the Volunteer and its contractors. These gates will be locked during non-construction hours.

4.3.11 DEMOBILIZATION

Demobilization will include the following:

- Restoration of areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management area[s], and access area);
- Removal of temporary access areas (whether on-Site or off-Site) and restoration of disturbed access areas to pre-remediation conditions;
- Removal of sediment and erosion control measures and disposal of materials in accordance with acceptable rules and regulations;
- Equipment decontamination; and
- General refuse disposal.

4.4 REPORTING

4.4.1 WEEKLY REPORTS

Weekly reports will be submitted to NYSDEC and NYSDOH Project Managers on Monday following the end of the week of the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e. tons of material exported and imported, etc.);

- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and,
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.
- A description of any CAMP exceedances recorded, and actions taken, and the effectiveness of actions taken to remedy any exceedances. In addition to the weekly reporting, any CAMP exceedances recorded will be reported to the NYSDEC and NYSDOH project managers on a daily basis.
- A description of CAMP noise, odor, and/or vibration complaints will be reported to the NYSDEC and NYSDOH project managers on a daily basis.

4.4.2 OTHER REPORTING

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital (JPEG) format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be submitted to NYSDEC on CD or other acceptable electronic media and will be sent to NYSDEC's Project Manager (2 copies) and to NYSDOH's Project Manager (1 copy). CDs will have a label and a general file inventory structure that separates photos into directories and sub-directories according to logical Remedial Action components. A photo log keyed to photo file ID numbers will be prepared to provide explanation for all representative photos.

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

4.4.3 COMPLAINT MANAGEMENT PLAN

A public information board will be constructed at the perimeter of the Site. This information board will contain the phone number of the Volunteer where complaints may be directed. General information notices to the public will also be posted on this board for their benefit.

4.4.4 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN

If there are any deviations from the RAWP, the following steps will be taken:

- Reasons for deviating from the approved RAWP will be identified and communicated directly to the NYSDEC Project Manager;
- All deviations will be communicated verbally and in writing (by letter or email) to the NYSDEC Project Manager;
- The deviations will be implemented based on verbal or written approval of the NYSDEC Project Manager. All verbal approvals will be followed-up in writing.
- The effect of the deviations on the overall remedy will be described/addressed in the FER.

4.5 AGENCY APPROVALS

The Volunteer has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction. The planned end use for the Site is in conformance with the current zoning for the property as determined by the New York City Department of City Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

A complete list of all federal, state and local governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work is attached will be obtained and provided in the Final Engineering Report. This list includes a citation of the law, statute or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the Final Engineering Report.

All planned remedial or construction work in regulated wetlands and adjacent areas will be specifically approved by the NYSDEC Division of Natural Resources to ensure that it meets the requirements for substantive compliance with those regulations prior to the start of construction. Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose.

5.0 REMEDIAL ACTION

Remedial action to address soil contamination consists of the installation of SOE and excavation and removal for offsite disposal. Soils will be characterized for disposal and disposal facilities will be predetermined with facility approvals in place prior to remediation. Removal of all contaminated soils is being conducted in accordance the excavation plan presented as **Figure 2.2.**

Groundwater impacts identified at the Site are expected to be remediated by implementing an ISCO groundwater injection program. **Figure 5.1** presents a design for the groundwater treatment. A PDI will be conducted to better characterize the groundwater and bedrock conditions at the Site and to develop the final injection plan. Groundwater sampling will be conducted to assess the effectiveness of the groundwater remedy.

Finally, in accordance with New York City Department of Buildings requirements, a soil vapor barrier and waterproofing membrane are being installed as part of the sub-slab construction within the building footprint. Additionally, components of a passive SSDS—which may be upgraded to an active system depending on the results of the SVI evaluation—will be installed.

Temporary institutional and engineering controls may be implemented to address contamination in groundwater and soil vapor for a conditional Track 1 remedy. In this case, an environmental easement will be filed and a Site Management Plan (SMP) will be developed to ensure the continued protectiveness of the remedy.

5.1 CLEANUP OBJECTIVES

The Soil Cleanup Objectives for this Site are the Track 1 UUSCOs as listed in **Appendix E**.

- The SCOs for this Site are the Track 1 UUSCOs.
- The groundwater cleanup objectives will be the NYSDEC TOGS AWQS.
- The soil vapor objectives will be the most recent NYSDOH Guideline Values and Decision Matrices for the specific contaminants of concern including in the matrices therein.

5.2 SOIL REMEDIAL ACTION

Removal of all contaminated soil under the Remedial Action for the Site will be implemented in accordance with the Site-specific QAPP (**Appendix C**). Soil exceeding the UUSCOs extends to a depth of 21.5 ft-bgs based on the RI and prior investigation performed. A plan depicting the locations where the remedial excavation activities will be carried out to planned depths of 21.5 ft-bgs is included as **Figure 2.2**. The depth was determined based on the deepest exceedance of the UUSCOs documented during prior investigations and remedial investigations, plus a foot or two of additional depth. The estimated excavation volume is approximately 2,500-3,000 cubic yards (cy) of planned remedial excavation. If the excavation of soils exceeding UUSCOs cannot be accomplished due to Site restrictions, the remaining soils will be compared to RSCOs for a Track 2 contingency remedy.

5.3 GROUNDWATER REMEDIAL ACTION

The anticipated groundwater remedial action is ISCO injections to reduce the contaminant levels to within AWQS or to acceptable asymptotic levels. The ISCO material will be injected through a series of injection points and the effectiveness will be monitored by a post-remediation sampling program. The conceptual treatment design including the well placements for post treatment monitoring is presented on **Figure 5.1**.

In addition to the groundwater injections, and provision for supplemental injections based on the post-remediation sampling, means and methods for product extraction will be considered in the event that high concentrations of contamination are found that would make injections problematic or impractical. If product extraction is deemed necessary, this will be implemented prior to completion of injections. The extracted water will be stored for off-site treatment or will be treated on-site for disposal in the City sewage under a discharge permit. The discharged water will sampled per the permit requirements and will be discharged only if it meets the permits concentration levels.

5.3.1 PRE-DESIGN INVESTIGATION (PDI)

The groundwater remedial design has been developed based on existing data. In order to optimize the parameters of the treatment program, additional investigation will be undertaken as part of a PDI. The PDI will consist of the installation of five bedrock investigation boreholes. The boreholes will be drilled to approximately 70 ft-bgs and will be evaluated using downhole geophysical techniques. The details of the boreholes and geophysical surveys are presented in the Supplemental RIWP (**Appendix F**).

5.3.2 GROUNDWATER IN-SITU REMEDIAL ACTION

Pending completion of the PDI and evaluation of the data, a detailed design document will be provided to the NYSDEC for review and approval prior to the implementation of the groundwater treatment remedy. The design document will detail the number, location and depth of injection points; the volume of material to be injected; and the sampling protocol to measure the effectiveness. Upon approval of this document, the injections will be implemented in accordance with the approved design document and governing documents (HASP, CAMP, etc.).

5.4 SOIL VAPOR REMEDIAL ACTION

Although it is expected that the removal of impacted soils and remediation of elevated groundwater concentrations will significantly reduce the potential for vapor intrusion in the future redevelopment of the property, further measures will be taken to mitigate vapor intrusion risk. As discussed previously, these measures will consist of installation of the elements of an SSDS underneath the building foundation if the sub-slab of the proposed building is not under the water table during the seasonal low. A soil vapor intrusion evaluation will be conducted, when the construction of the proposed building has been completed, to determine if the soil vapor levels constitute a VI risk. The elements of the SSDS will be turned into EC as an active SSDS if the soil vapor evaluation determines that vapor mitigation is needed. A 20-MIL sealing vapor barrier will also be installed beneath the basement slab of the proposed building.

5.5 REMEDIAL PERFORMANCE EVALUATION

5.5.1 END-POINT SAMPLING FREQUENCY

For all excavations, post-excavation soil samples will be collected in accordance with Section 5.4 of DER-10 for analysis of TCL+30/TAL, PFAS, and 1,4-dioxane. All impacted Site soils will be removed down to depths up to 21.5 ft-bgs within the final SOE boundary as required to achieve the Track 1 remediation. Endpoint verification sampling will be implemented on an approximately 30 x 30 foot grid, or every 900 square feet (SF) at the base of the excavation and documented by field personnel. Proposed end point sampling locations are presented as **Figure 5.2**.

End-point samples will be collected manually from the top six (6) inches of soil from the bottom of the excavation. In addition to each end-point sample, two additional samples will be collected from 1.0-1.5 and 2.0-2.5 feet below the initial sample and will be placed on hold. If the initial end-point sample exceeds the UUSCO standards, the contingent samples will be analyzed to achieve compliance. The soil will then be excavated to the required depth determined by the contingency samples. If the results of the contingent samples exceed the UUSCO standards, the process will continue until the analytical results are compliant or bedrock is encountered, whichever occurs first. Regardless the depth of the over excavation, confirmation samples will be collected for every one foot of additional excavation depth. These samples will be held and run as needed to ensure that an accurate account of the volume of excavated impacted soils can be derived. Confirmatory sampling locations will be surveyed and the location and elevation will also be recorded and presented on the final soil removal maps. Documentation will be presented in the FER.

5.5.2 GROUNDWATER SAMPLING

The remedy will include mass source removal during the remedial excavation, dewatering to remove some contaminated groundwater, and in-situ zero valent iron injections. Groundwater sampling will be conducted in order to verify that the groundwater remedy is effective. The goal of the groundwater remedy is to achieve the TOGS AWQS standards or to reach asymptotic levels. Residual groundwater VOC contamination will be monitored following treatment to determine if additional injections are required to meet remedial objectives and prevent off-site migration. Groundwater treatment will be implemented until the groundwater levels are below the standards or until they reach asymptotic levels that are accepted by the NYSDEC. The proposed post remediation groundwater sample locations are depicted on **Figure 5.1**. A typical well construction diagram is provided in **Appendix G**.

5.5.3 VI MITIGATION AND EVALUATION SAMPLING

Installation of the elements of an SSDS underneath the building foundation if the sub-slab of the proposed building is not under the water table including during the seasonal low. The venting layer consists of six to eight inches of sand or crushed stone with a network of perforated pipes that act as transmission conduits for the contaminated soil gas. The perforated pipes are vented to the outside with risers. The system will be designed as passive with the possibility of switching to active if active venting is needed to meet the VI indoor air objectives. The sealing methodology will consist of a vapor barrier comprised of 20-mils thickness of high or low-density polyethylene (H or LDPE) or an approved equal. The vapor barrier will be installed on top of the venting layer just below the slab to provide the required sealing layer as stated in the NYSDOH Guidance. All the utility penetrations into the slab will also be sealed. Sampling ports will be built into the vapor barrier to prevent future sampling penetrations.

The SSDS operation and monitoring will be described in a SMP. Following installation of the SSDS, a soil vapor intrusion evaluation will be conducted to determine if the SSDS needs to be made active, and thereafter if an active system is required, to determine the ongoing long-term presence or mitigation of VI. If within the five-year period the VOC concentrations in the sub slab and indoor air drop to levels below the mitigate threshold requirements, a work plan will be submitted to NYSDEC and NYSDOH for their review and approval to shut down and/or remove the SSDS. If the work plan is approved and the SSDS shut down, it will not be considered an EC anymore and the condition on the Track 1 remedy will be removed.

5.6 METHODOLOGY

Soil samples will be collected in accordance with the QAPP using disposable gloves/trowels or dedicated, decontaminated stainless steel spoons. Groundwater samples will be collected in accordance with the QAPP using the low-flow purging and sampling method and associated decontamination and quality control procedures.

5.7 REPORTING OF RESULTS

The samples will be submitted to a NYSDOH Environmental Laboratory Accreditation Program (ELAP) certified laboratory. The results will be reported in accordance with NYSDEC requirements for Category B data deliverables (as outlined in DER-10). In addition, all data collected during the remedial action will be submitted in the NYSDEC approved Electronic Data Deliverable format using the NYSDEC's Environmental Information Management System database software application EQuIS^{TM}.

5.8 QA/QC

Collection of quality assurance/quality control (QA/QC) samples to evaluate potential cross-contamination from sampling equipment and during shipment of samples and repeatability of laboratory analytical practices will be in accordance with the QAPP included as **Appendix C**. Field blanks, trip blanks and duplicate samples associated with daily sampling activities will be collected as a part of the QA/QC practices.

5.9 DATA USABILITY SUMMARY REPORT (DUSR)

To ensure that the field sampling and laboratory analytical practices are acceptable, the data associated with all the samples will be validated by a third party (in accordance with requirements of DER-10). The validation approach and results will be presented in a DUSR to be included in the FER.

5.10 REPORTING OF END-POINT DATA IN FER

The FER will include a table of final soil and groundwater sample data with highlights or a summary of exceedances of the Track 1 UUSCOs and AWQS.

The FER will include a table of end point data with highlights or a summary of exceedances of SCOs. A spider map showing all SCO exceedances will also be presented in the FER.

Analytical laboratories used for all end-point sample analysis and contingency sample analysis will be NYSDOH ELAP certified.

End point sampling, including bottom and side-wall sampling where needed, will be performed in accordance with DER-10 sample frequency requirements at a rate of one for every 900 square feet. A post-treatment sampling plan is shown in **Figure 5.2** where the grids are 30 by 30 feet. Post excavation samples will be collected from center of each grid as the excavation proceeds. In addition, although not depicted on the plan, sidewall samples will be collected within the Site in accordance with DER-10 where adjacent grids are excavated to different depths (greater than 2 foot variance). The results will be shared with the NYSDEC in the weekly report. The FER will provide a tabular and map summary of all end-point sample results and exceedances of SCOs.

5.11 ESTIMATED MATERIAL REMOVAL QUANTITIES

Source removal excavation activities will be implemented during the course of the remediation activities throughout the footprint of the Site. Based on the RI, the depth of contaminated fill/ soil ranges from 0.5 to 21.5 ft-bgs. The entire Site within the SOE will be excavated to remove all soil exceedances in order to achieve a Track 1 remedy.

The estimated quantity of soil/fill to be removed from the Site is approximately 2,500-3,000 CY. Required excavation depths are varied based upon contaminant depths determined during the Prior Investigations and remedial investigation work. A plan depicting the proposed excavation depths is included as **Figure 2.2**. The depth was determined based on the deepest exceedance of the SCO documented during the prior investigations and RI plus additional one or two feet of depth. The actual excavated volume will be reported in the FER as a tally of the manifests and tickets of the soils disposed off-site.

5.12 SOIL/MATERIALS MANAGEMENT PLAN

Material will be required to be excavated during remediation activities. Any required fill will consist of imported clean fill that meets the requirements per 6 NYCRR Part 375-6.8(d) and the requirements for emerging contaminants sampling per the October 2020 NYSDEC Guidance Document.

5.12.1 SOIL SCREENING METHODS

Visual, olfactory and PID soil screening and assessment will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially contaminated material (Residual Contamination Zone). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development phase, such as excavations for foundations and utility work, prior to issuance of the Certificate of Completion.

All primary contaminant sources identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the FER.

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

5.12.2 STOCKPILE METHODS FOR CONTAMINATED SOILS

Stockpiles of contaminated materials, if needed, will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Soil stockpiles will be encircled with silt fences. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

5.12.3 MATERIALS EXCAVATION AND LOAD-OUT

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

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

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

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

A truck wash associated with construction activities will be operational during construction. A truck wash is always required for large soil excavation projects such as this. The Remediation Engineer will be responsible for ensuring that all outbound trucks are not causing any off-site tracking of the contaminated soils.

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

The Remediation Engineer will ensure that all egress points for truck and equipment transported from the Site will be clean of dirt and other materials derived from the Site during Site remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

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

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

5.12.4 MATERIALS TRANSPORT OFF-SITE

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

Truck transport routes will be included in the SOP. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes.

Proposed inbound and outbound truck routes to the Site will take into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; (f) overall safety in transport; and (g) community input, which was sought and obtained during the SEQRA EIS process.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Queuing of trucks will be performed on-Site in order to minimize off-Site disturbance. Off-Site queuing will be prohibited.

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

A tracking pad will be installed at the Site egress to ensure clean-up of the soils from the truck tires. If needed, truck tires will be washed. Truck wash waters will be collected and disposed of off-Site in an appropriate manner.

5.12.5 MATERIALS DISPOSAL OFF-SITE

Approval from appropriate disposal facilities will be received prior to start of work. The total quantity of material expected to be disposed off-Site is 2500-3000 CY.

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site will not be undertaken without formal NYSDEC approval.

Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

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

Non-hazardous historic fill and contaminated soils taken off-Site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2.

Historical fill and contaminated soils from the Site are prohibited from being disposed at Part 360-16 Registration Facilities (also known as Soil Recycling Facilities).

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

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

Hazardous wastes, if any, derived from on-Site will be stored, transported, and disposed of in full compliance with applicable local, State, and Federal regulations.

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

Waste characterization will be performed for off-Site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

5.12.6 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. If any liquids need to be discharged into the sewer system, then approval by local utility authority and NYSDEC will be sought prior to the discharge. Dewatered fluids will not be recharged back to the land surface or subsurface of the Site without NYSDEC approval.

Water generated during remedial construction will not be discharged to surface waters (i.e. a local pond, stream or river) without a state pollutant discharge elimination system permit.

5.12.7 BACKFILL FROM OFF-SITE SOURCES

Backfilling is expected to be needed in certain of areas on the Site. The imported material, if needed, will be sampled in accordance with DER-10 Section 5.4 (e) Table 5.4 (e)10 and paragraph 10. The samples will be analyzed for TCL VOCs, TCL SVOCs, pesticides, PCBs, and TAL metals, including cyanide. The soil may be used as cover material provided that all parameters meet the UUSCOs, per the NYSDEC regulatory requirements. In addition, composite samples will be collected for emerging contaminants in accordance with the NYSDEC Sampling, Analysis, and Assessment of Per-and-Polyfluoroalkyl Substances (April 2023).

All materials proposed for import onto the Site will meet the UUSCOs, will be approved by the Remedial Engineer, and will be in compliance with provisions in this RAWP prior to receipt at the Site. A "Soil Reuse/Import" form will be submitted to the NYSDEC for pre-approval prior to importing any soils on -Site. Bills of Lading or equivalent documentation will be obtained to track the amount soil arriving onto the Site and verify the source of soil being imported.

Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

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

All imported soils will meet NYSDEC approved backfill or cover soil quality objectives for this Site. Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC. Nothing in the approved Remedial Action Work Plan or its approval by NYSDEC will be construed as an approval for this purpose.

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

Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers.

5.12.8 CONTINGENCY PLAN

If underground storage tanks (USTs) or other previously unidentified contaminant sources are found during on-Site remedial excavation or development related construction, sampling will be performed on product, sediment, and surrounding soils, etc. Chemical analytical work will be for full scan parameters (TCL/TAL).

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

If USTs are discovered during soil remediation, the NYSDEC Project Manager will be notified within 24 hours of discovery. The USTs will be assessed to determine the size and contents. If the USTs (s) are determined to be regulated the tanks will be registered.

If any liquids have accumulated in the tanks, they will be pumped and disposed of accordingly. The disposal of the liquids will be manifested. The tanks will be cleaned for appropriate scrap metal disposal.

During the UST and piping removal effort, the following field observations will be made and documented. A description and photographic documentation of tank and pipeline conditions (e.g., pitting, holes, or leak points).

The excavation floor and sidewalls will be examined for any physical evidence of soil or groundwater contamination, and field screened with a calibrated PID at transects spaced no more than five (5) feet apart, so that sampling may be biased to the suspected location of greatest contamination.

Immediately after tank removal, if there is no evidence of a discharge in the existing UST excavations, confirmatory soil samples will be collected to demonstrate that the remaining soils meet the SCOs. If no groundwater is present in the excavation, discrete center line soil samples from the bottom of the excavation will be collected at a frequency equal to the total length of the tank in feet divided by five (5) (minimum of one (1) sample) and one (1) sample will be added for the fraction thereof.

If groundwater is present in the excavation soil samples will be collected as follows:

- One (1) sample based upon field screening results will be taken near or just above the water table from each excavation sidewall for every 30 linear feet of sidewall (minimum of one [1] sample per sidewall).
- Where seasonal fluctuations in the water table elevation can submerge and smear product over a range of several feet, additional samples will be collected in the smear zone.

If there is evidence of a discharge, excavation will continue until all contaminated soils are removed. All grossly contaminated soils as determined by field screening will be removed. Then excavation will continue until all post-excavation confirmatory samples meet the unrestricted SCOs, or until further excavation is no longer feasible

.

Confirmatory post excavation soil samples will be collected to demonstrate that all the contamination has been removed as follows:

- One (1) sidewall sample will be collected for each 30 linear feet of excavation, minimum four (4) samples one on each sidewall and one (1) bottom sample for every 900 square feet of excavation area minimum one sample. Based upon field screening, the samples will be biased toward the suspected location of greatest contamination.
- If the planned remedial excavation is deeper than the depth of the UST, then the confirmation samples will be collected at the planned end-point sample depth for that cell.

The UST confirmatory soil samples will be sent to an ELAP-certified laboratory for TCL/TAL+30. If analytical results of soil sampling identify impacts exceeding the unrestricted SCOs, additional excavation/removals will be conducted to the NYSDEC satisfaction in hotspot areas, and additional confirmatory soil samples will be collected.

Any contaminated groundwater will be addressed as part of the groundwater remediation. However, if groundwater is encountered in the excavation, it will be observed for sheen or light non-aqueous phase liquid (LNAPL) and a sample may be collected from the excavation. If any LNAPL is observed, it will be excavated/removed to the NYSDEC's satisfaction.

All excavated soils will be characterized for proper disposal. The characterization samples will be collected in accordance with the disposal facility requirement.

Any groundwater or LNAPL that requires removal from the excavation will be either pumped in a Frac Tank or removed with a Vacuum Truck depending on the quantity and properly disposed of off-site.

SESI will document tank closures in the FER that documents the procedures for removal of the USTs in accordance with New York City Department of Health (NYCDOH) regulations including the following:

- A discussion which details the removal of any residual liquids, purging of vapors, tank inerting, tank and piping removal procedures, tank cleaning and tank disposal;
- A discussion of end point sampling and analysis and results;
- A discussion of soil removed and disposed from the Site;
- A discussion of the excavation water handling and treatment, if applicable;

5.12.9 COMMUNITY AIR MONITORING PLAN

A copy of the CAMP for the Site is included as **Appendix D**. Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers report to NYSDEC within 24 hours and included in the weekly reports.

5.12.10 ODOR, DUST, AND NUISANCE CONTROL PLAN

Odor, dust, and nuisance control will be in accordance with the site-specific Health and Safety Plan and the CAMP as specified in Section 5.12.9 of this RAWP. The FER will include the following certification by the Remedial Engineer: “I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan.”

Odor Control Plan

This odor control plan is designed to control emissions of nuisance odors off-Site. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Applicant's Remediation Engineer, who is responsible for certifying the Final Engineering Report.

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

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

Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-Site work, will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-Site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water truck sprinkling.

Other Nuisances

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

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

6.0 ENGINEERING CONTROLS

6.1 GROUNDWATER MONITORING SYSTEM AND CRITERIA FOR COMPLETION

A network of groundwater monitoring wells will be installed in locations approximate to the RI monitoring well network that will be utilized to monitor the groundwater quality and to demonstrate the reduction in groundwater contamination to asymptotic levels. As the dissolved groundwater impacts detected during the remedial investigation are relatively low, a short -term monitoring program with associated institutional controls will be a cost-effective remedial alternative to address these impacts. Short-term groundwater monitoring protocols and frequency will be described in the Site Management Plan.

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC, until remaining groundwater contaminant of concern concentrations are found to be consistently below NYSDEC standards or have become asymptotic at levels accepted by the NYSDEC over a period of time. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional treatment and/or control measures will be evaluated. These monitoring activities will be outlined in the Monitoring Plan of the SMP.

6.2 SUB-SLAB DEPRESSURIZATION SYSTEM (SSDS)

A SSDS including the following elements will be installed in the proposed building:

- Venting layer: a layer of stone installed underneath the building slab;
- Pipes: A network or perforated pipes that are embedded in the venting layer and connected with header pipes;
- Risers: the risers are solid pipes that are connected to the header pipes and vent to the outside of the building; and
- Sampling ports to collect sub-slab soil vapor samples.

The sub-slab soil vapor samples, along with indoor air samples, will be collected when the first floor of the building is enclosed. If deemed necessary based on sub-slab and indoor air sampling data, the SSDS will be made active with a vacuum blower making the SSDS an engineering control.

7.0 INSTITUTIONAL CONTROLS

In the event that the remedy does not achieve Track 1 unrestricted use, institutional controls in the form of an environmental easement will be imposed.

7.1 ENVIRONMENTAL EASEMENT

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination is left on-Site after the Remedial Action is complete. The Environmental Easement renders the Site a Controlled Property and if required will be recorded with the New York County Clerk before the Certificate of Completion is issued by NYSDEC.

As part of this remedy, if required, an Environmental Easement approved by NYSDEC will be filed and recorded with the New York County Clerk. The Environmental Easement will be submitted as required by the NYSDEC. Groundwater monitoring and a soil vapor evaluation will be incorporated into a Site Management Plan and will be enforceable through an Environmental Easement. It soil vapor evaluation determines that soil vapor mitigation is required, then the elements of the SSDS will become an engineering control as an active SSDS with a blower installed.

7.2 SITE MANAGEMENT PLAN

Site Management is the last phase of remediation and begins with the approval of the FER and issuance of the Certificate of Completion for the Remedial Action. Since an SMP is needed because of remaining groundwater and soil vapor contamination, it will be submitted for approval prior to the approval of the FER. Site Management will not be discontinued unless prior written approval is granted by the NYSDEC and NYSDOH. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the Site Management Plan are performed.

The SMP is intended to provide a detailed description of the procedures required to manage the Site until an unconditional Track 1 unrestricted use is achieved. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of a Monitoring Plan and SVI Evaluation; (3) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (4) defining criteria for termination of monitoring. The SMP for this Site, if needed, will not require the development of a plan to operate and maintain treatment, collection, containment, or recovery systems because the only proposed ongoing remedy will be monitoring the wells and evaluating soil vapor intrusion.

To address these needs, this SMP will include three (3) plans as applicable: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; and (3) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated December 2002, and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. A Periodic Review Report (PRR) will be submitted to the NYSDEC beginning 16 months after the Certificate of Completion is issued. After the initial PRR, the next PRR will be submitted annually to the NYSDEC.

The SMP and the FER will include a monitoring plan for groundwater at the upgradient and the downgradient Site perimeter to evaluate Site-wide performance of the remedy. Groundwater monitoring wells will be installed immediately downgradient of all remediation areas to monitor the natural attenuation. If the contaminants in groundwater do not attenuate below the Class GA AWQS concentrations or reach an asymptotic level that is accepted by the NYSDEC, an active treatment (e.g. oxidant injection) will be proposed and designed based on the monitoring data.

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

8.0 FINAL ENGINEERING REPORT

A FER and Site Management Plan will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The FER will include as-built drawings for all constructed elements, certifications, manifests, bills of lading as well as the complete Site Management Plan. The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP and associated design documents. The FER will provide a tabular summary of all performance evaluation sampling results and all material characterization results and other sampling, and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. Applicable analytical data collected under this RAWP will be accompanied by DUSRs in the FER. The FER will document that all applicable analytical data was submitted to and accepted by the Department in the Department's approved Electronic Data Deliverable format. The FER will be prepared in conformance with DER-10.

Where determined to be necessary by NYSDEC, a Financial Assurance Plan will be required to ensure the sufficiency of revenue to perform long-term operations, maintenance and monitoring tasks defined in the Site Management Plan and Environmental Easement. This determination will be made by NYSDEC in the context of the FER review.

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

The FER will include an itemized tabular description of actual costs incurred during all aspects of the Remedial Action.

The FER will provide a thorough summary of all residual contamination left on the Site after the remedy is complete. Residual contamination includes all contamination that exceeds the Track 1 UUSCO in 6NYCRR Part 375-6. A table that shows exceedances of Track 1 UUSCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER. A map that shows the location and summarizes exceedances of Track 1 UUSCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

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

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

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

8.1 CERTIFICATIONS

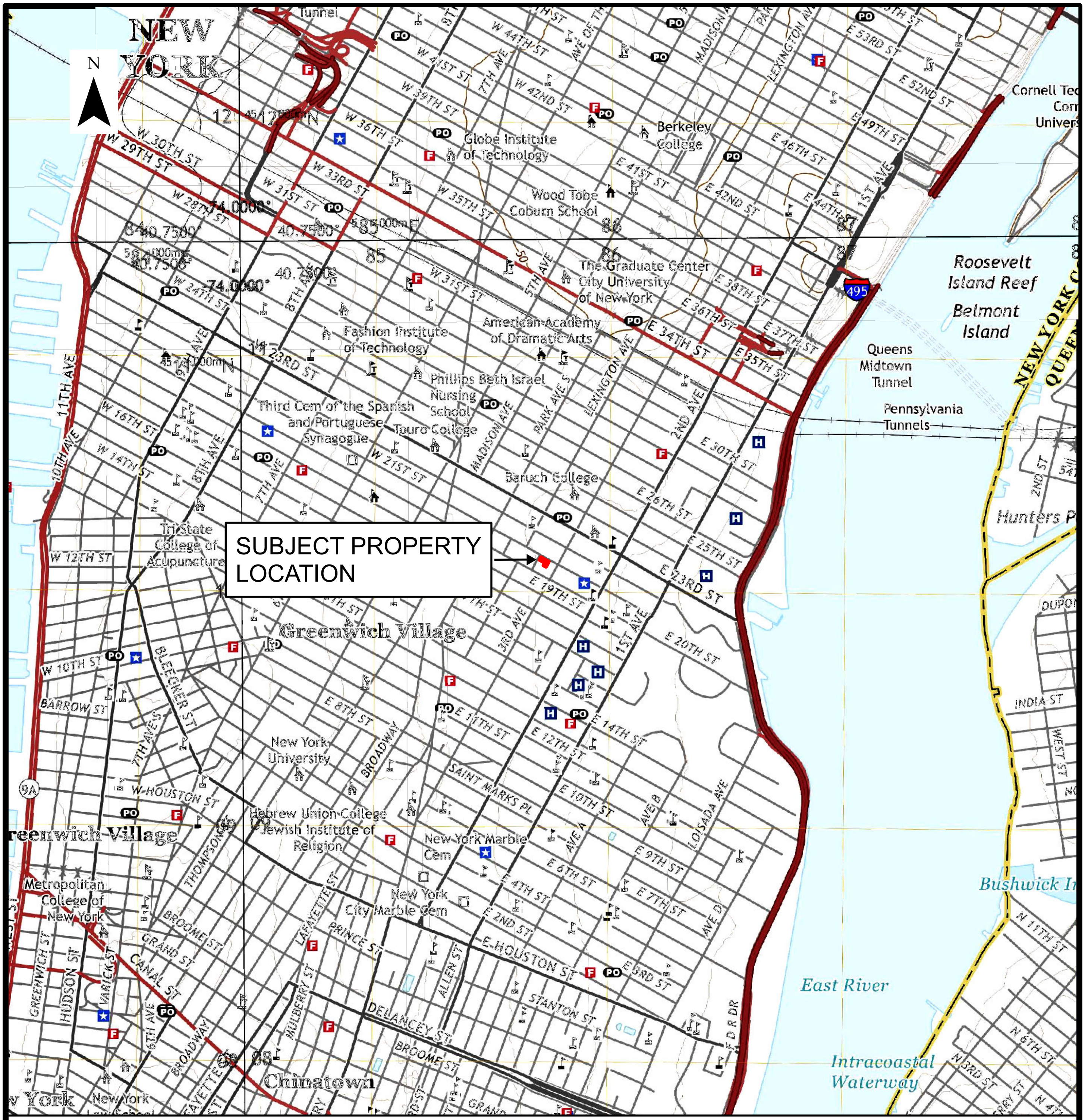
The following certification will appear in front of the Executive Summary of the Final Engineering Report. The certification will be signed by the Remedial Engineer, Fuad Dahan, who is a Professional Engineer registered in New York State. This certification will be appropriately signed and stamped. The certification will include the following statements:

I ___________certify that I am currently a NYS registered professional engineer, I had primary direct responsibility for the implementation of the subject construction program, and I certify that the Remedial Work Plan was implemented and that all construction activities were completed in substantial conformance with the DER-approved Remedial Work Plan.

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

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

Figures



REFERENCE:

UNITED STATES GEOLOGICAL SURVEY (USGS)
BROOKLYN, NY USGS QUADRANGLE - 2019

LEGEND:

🟥 SUBJECT PROPERTY LOCATION

SCALE: 1" = 2,000'

0 1,000 2,000 4,000 FEET

FIG-1.1

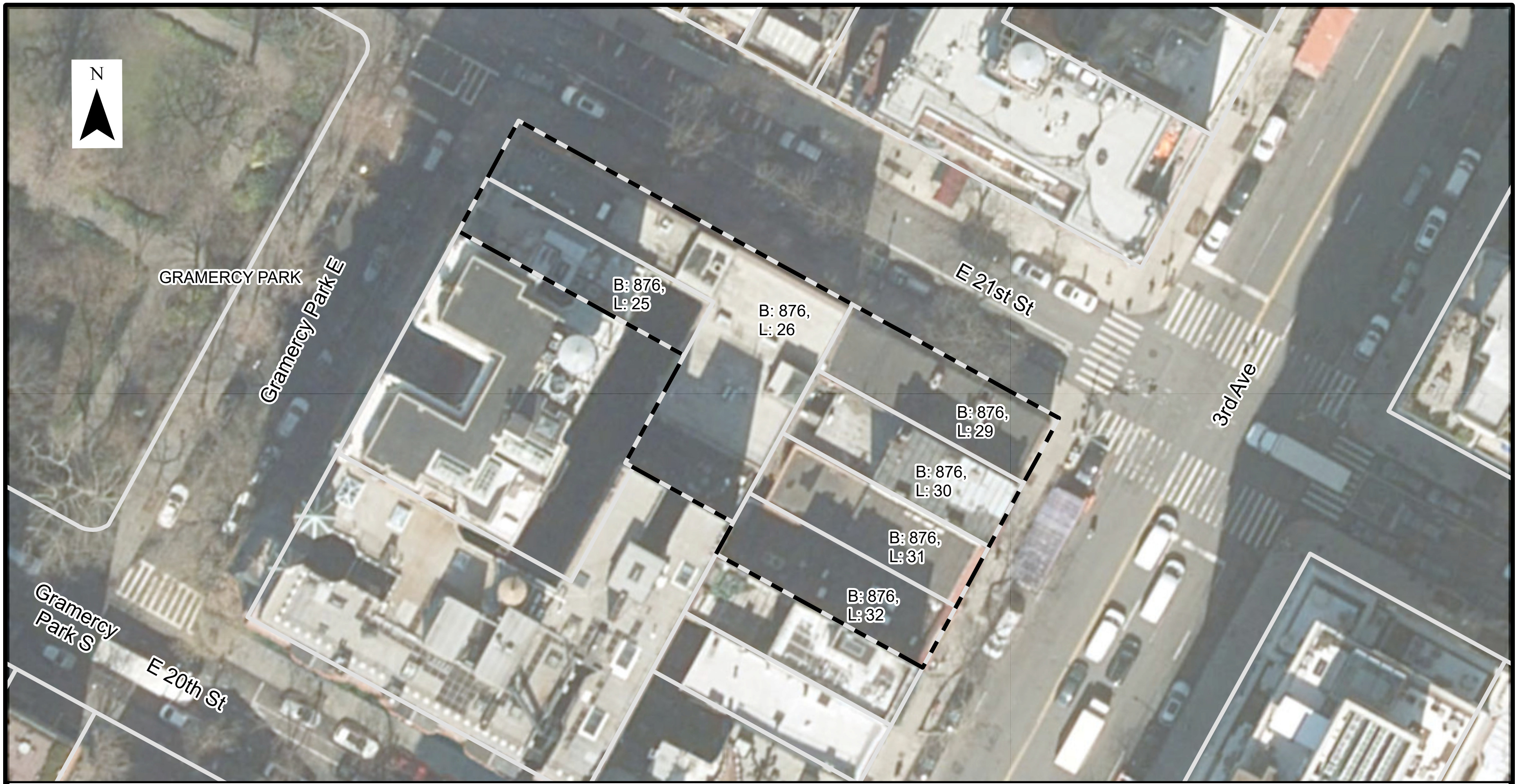
37 GRAMERCY PARK EAST AND
38 GRAMERCY PARK NORTH
BLOCK 876, LOTS 25 AND 26
NEW YORK, NY 10010

SUBJECT PROPERTY LOCATION MAP

SESI CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | SITE CIVIL
959 ROUTE 46E, 3RD FLOOR, PARSIPPANY, NJ 07054 PH: 973.808.9050

DRAWN BY: KBV
CHECKED BY: CM
SCALE: AS NOTED
DATE: 9/18/2024
JOB NO: 13542

Y:\GIS\Project_Numbers\13542\APRX_PROJECT\APRX_Phase1_Prj_No.aprx, 9/18/2024 1:18 PM, Kim Vanderklein, LAYOUT: FIG-1.1



REFERENCE:

NEW YORK STATE, MAXAR, MICROSOFT, NYS OFFICE OF INFORMATION TECHNOLOGY SERVICES - GIS PROGRAM OFFICE, NYS DEPT OF TAXATION AND FINANCE'S OFFICE OF REAL PROPERTY TAX SERVICES

LEGEND:

- ▭ SUBJECT PROPERTY LOCATION
- ▭ TAX PARCELS

SCALE: 1" = 50'

0 25 50 100 FEET

FIG-1.2

37 GRAMERCY PARK EAST, 38 GRAMERCY PARK NORTH, 252
TO 258 3RD AVENUE
BLOCK 876, LOTS 25, 26, AND 29-32
NEW YORK, NEW YORK 10010

SUBJECT PROPERTY PLAN

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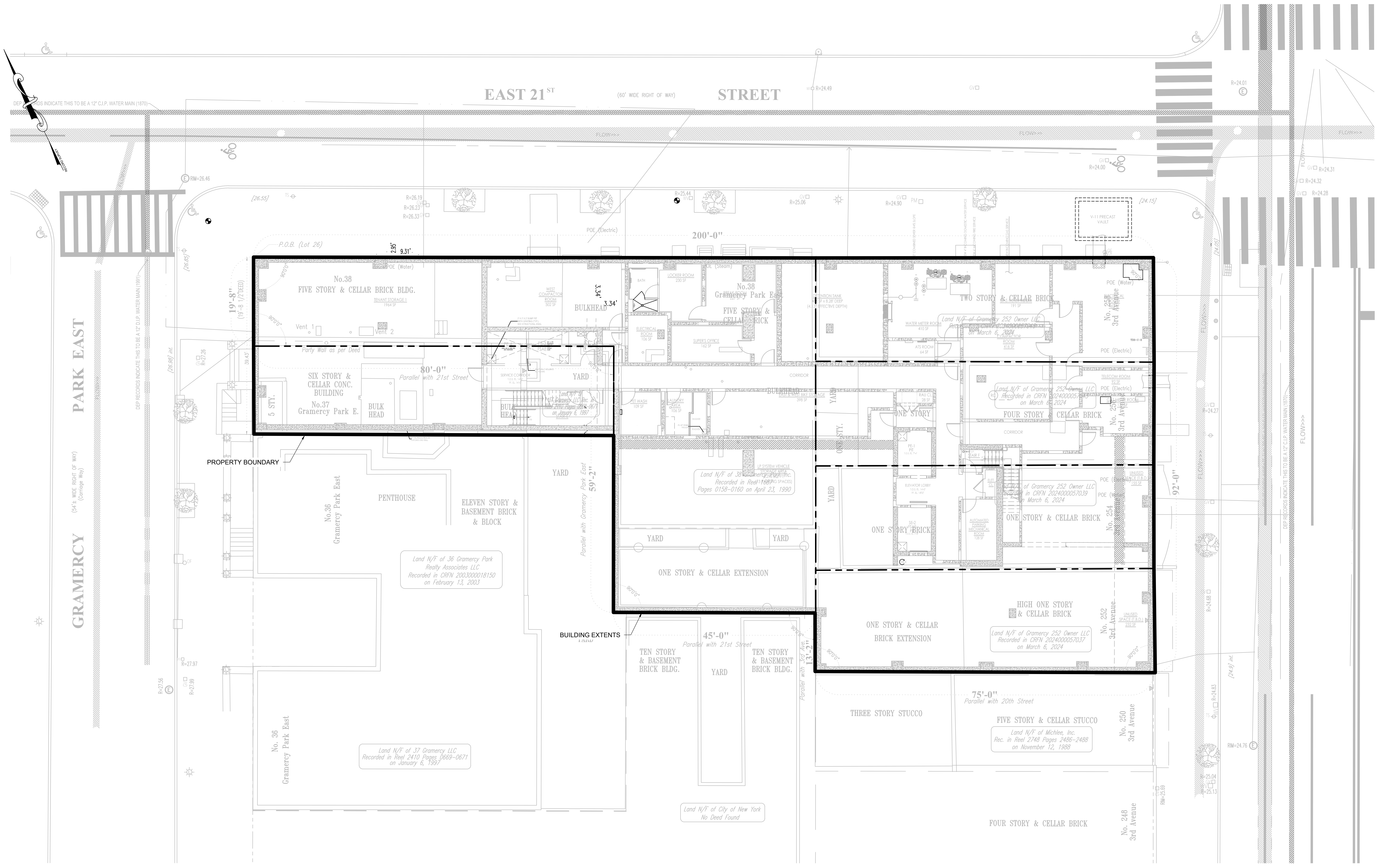
GEOTECHNICAL | ENVIRONMENTAL | SITE CIVIL
959 ROUTE 46E, 3RD FLOOR, PARSIPPANY, NJ 07054 PH: 973.808.9050

DRAWN BY:	KBV
CHECKED BY:	CM
SCALE:	AS NOTED
DATE:	10/9/2024
JOB NO.:	13542

Y:\GIS\Project_Numbers\13542\APRX_PROJECT\APRX_Phase1_Prj_No.aprx, 10/9/2024 9:40 AM, Kim Vanderklein, LAYOUT: FIG-1.3



Scale: 1"= 10'

REFERENCE
1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

NOTE:
THIS PLAN IS FOR LOCATING BORINGS & TEMP WELLS ONLY.
OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

N:\ACAD\13542\CAD\GEOTECH\[SS]\13542.DWG.SOIL_BORING_LOCATION_PLAN -37-38 - V2.DWG 05/29/25 05:26:24PM, pinnacle, LAYOUT:SOIL RESULTS AND EXCAV PLAN (37-38 252-258 GRAMERCY) F 2.4

rev	date	description	by

dwg by: AW
chk by: JL
scale: AS NOTED
date: 04/07/2025

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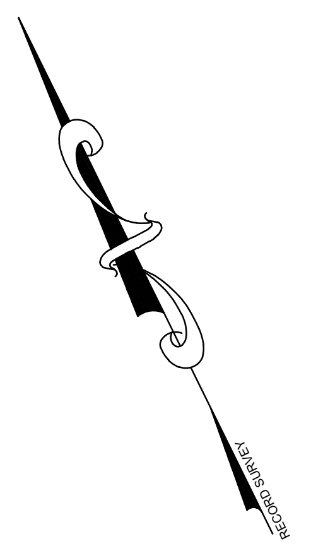
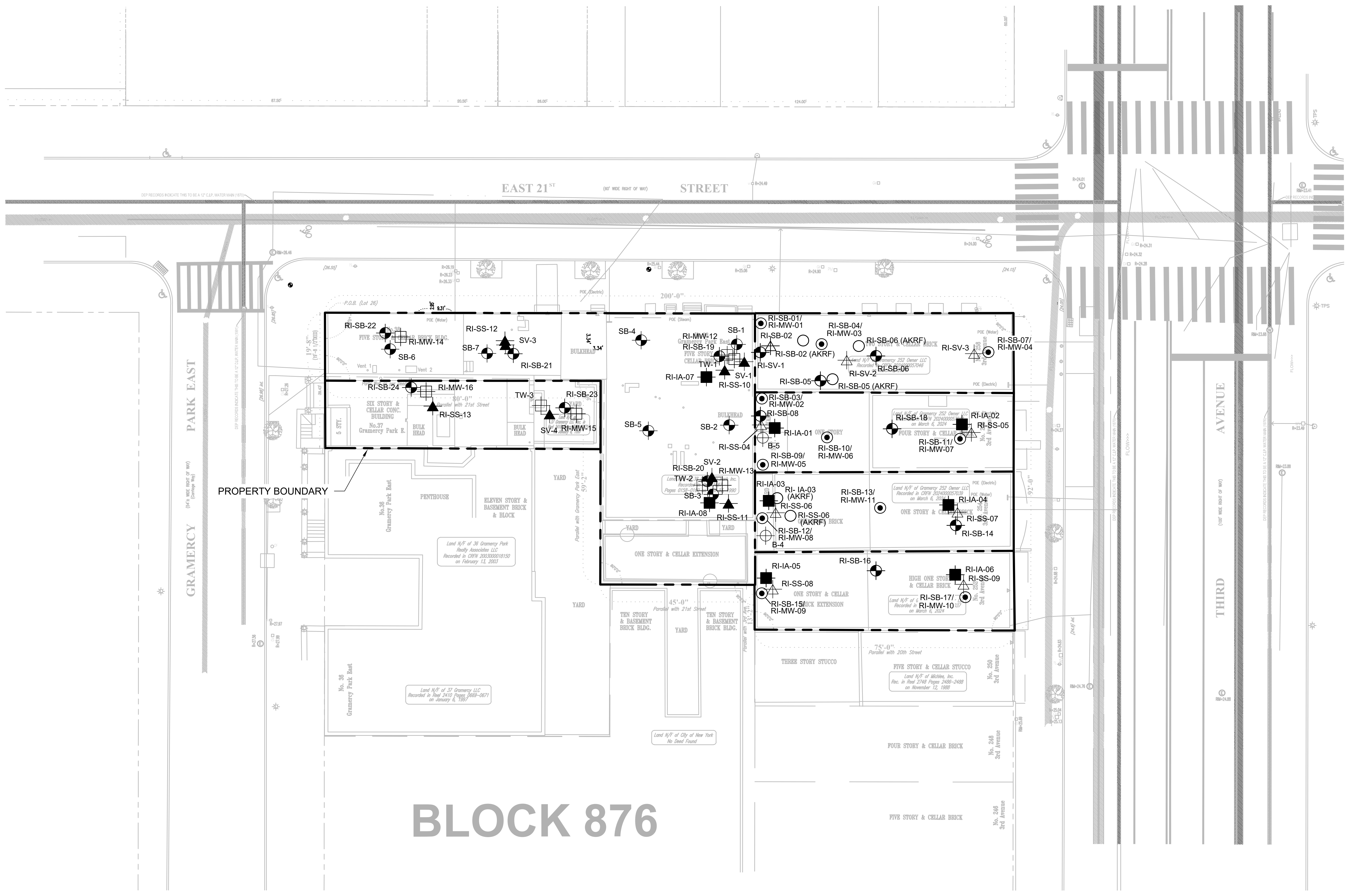
37 GRAMERCY PARK EAST, 38 GRAMERCY PARK NORTH
252 TO 258 3rd AVENUE
BLOCK 876, LOTS 25, 26, AND 29-32
NEW YORK, NEW YORK 10010

title: PROPOSED BUILDING FOUNDATION

job no. 13542
drawing no.

FIG-1.3





LEGEND:

RI-SB-21	- REMEDIAL INVESTIGATION SOIL BORING & APPROX. LOCATION
RI-SS-10	- REMEDIAL INVESTIGATION SUB-SLAB SOIL VAPOR POINT & APPROX. LOCATION
RI-MW-15	- REMEDIAL INVESTIGATION MONITORING WELL & APPROXIMATE LOCATION
RI-IA-06	- REMEDIAL INVESTIGATION INDOOR AIR SAMPLE POINT & APPROXIMATE LOCATION
RI-SV-1	- REMEDIAL INVESTIGATION SOIL VAPOR POINT & APPROXIMATE LOCATION
B-3	- GEOTECHNICAL SOIL BORING NUMBER & APPROXIMATE LOCATION
RI-SB-17/ RI-MW-10 ◉	- COMBINED REMEDIAL INVESTIGATION SOIL SAMPLE NUMBER, MONITORING WELL NUMBER AND APPROXIMATE LOCATION
AKRF SB-5 ○	- AKRF BORING NUMBER AND APPROXIMATE LOCATION
SB-2	- PHASE II SOIL BORING & APPROXIMATE LOCATION

REFERENCE
1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

NOTE:
THIS PLAN IS FOR LOCATING BORINGS, TEMP WELLS AND SOIL VAPOR POINTS ONLY. OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

Scale: 1"= 20'
0 10 20 40 60 80

rev	date	description	by

dwg by: AW
chk by: JL
scale: AS NOTED
date: 05/20/2025

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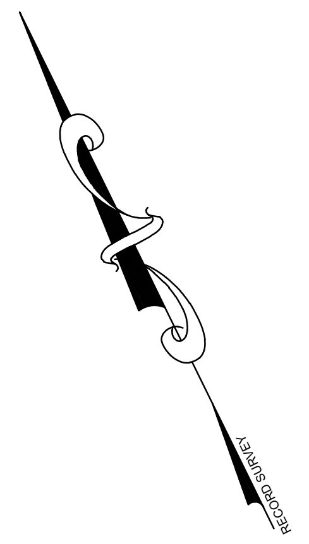
37 GRAMERCY PARK EAST, 38 GRAMERCY PARK NORTH
252 TO 258 3rd AVENUE
BLOCK 876, LOTS 25, 26, AND 29-32
NEW YORK, NEW YORK 10010

title:
BORING LOCATION PLAN

job no. 13542
drawing no.
FIG-2.1

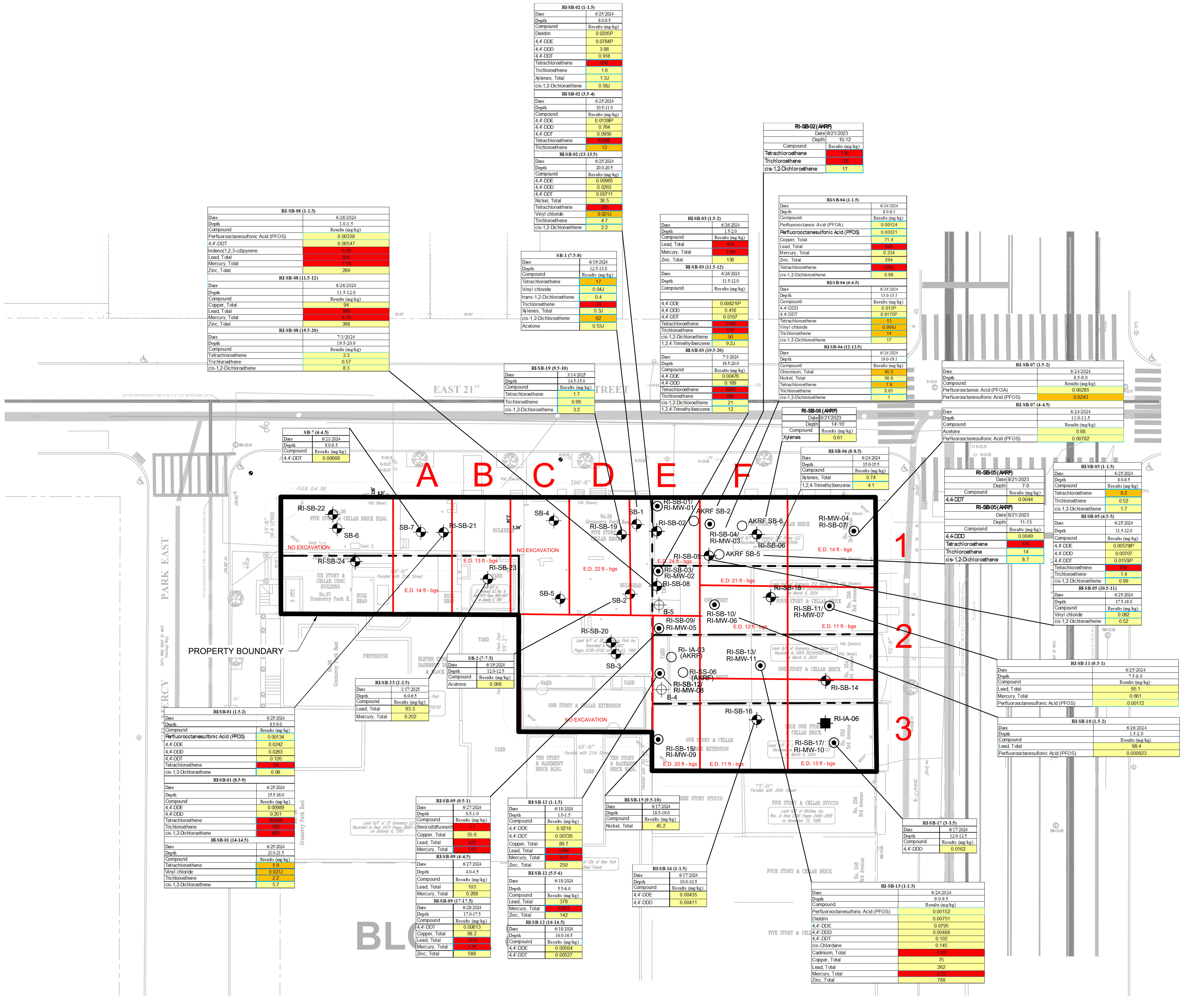
N:\ACAD\13542\CAD\GEOTECH\LOCATION PLANS\2025-04-01\13542.DWG.SOIL_BORING_LOCATION_PLAN -37-38 - V3.DWG 06/12/25 06:44:32AM, alan.ward, LAYOUT:BORING LOCATIONS



LEGEND:

RI-SB-21 - REMEDIAL INVESTIGATION SOIL BORING & APPROX. LOCATION
B-3 - GEOTECHNICAL SOIL BORING NUMBER & APPROXIMATE LOCATION
RI-SB-17/ RI-MW-10 ◉ - COMBINED REMEDIAL INVESTIGATION SOIL SAMPLE NUMBER, MONITORING WELL NUMBER AND APPROXIMATE LOCATION
AKRF SB-5 ○ - AKRF BORING NUMBER AND APPROXIMATE LOCATION
SB-2 - SOIL BORING & APPROXIMATE LOCATION

NOTES:
1. ALL BORINGS ADVANCED FROM BASEMENT ACCEPT RI-SB-3, 8, 9, 12, 13 (ADVANCED FROM STREET LEVEL).
2. ALL DEPTHS ARE REMEDIATION DEPTHS.
3. ALL EXCAVATION DEPTHS IN FEET BELOW STREET LEVEL (E.D. 15 ft - bgs).
4. BASEMENT DEPTH IS 8 ft FROM STREET LEVEL



		CasNum	NYSDEC PGSCO	NYSDEC UUSCOs	NYSDEC RSCOs	NYSDEC RRSCOs
Organochlorine Pesticides by GC						
	Dieldrin	60-57-1	0.1	0.005	0.039	0.2
	4,4'-DDE	72-55-9	17	0.0033	1.8	8.9
	4,4'-DDD	72-54-8	14	0.0033	2.6	13
	4,4'-DDT	50-29-3	136	0.0033	1.7	7.9
	cis-Chlordane	5103-71-9	2.9	0.094	0.91	4.2
Perfluorinated Alkyl Acids by EPA 1633						
	Perfluorooctanoic Acid (PFOA)	335-67-1	0.0008	0.00066	0.0066	0.033
	Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.001	0.00088	0.0088	0.044
Semivolatile Organics by GC/MS						
	Benzo(b)fluoranthene	205-99-2	1.7	1	1	1
	Indeno(1,2,3-cd)pyrene	193-39-5	8.2	0.5	0.5	0.5
Total Metals						
	Cadmium, Total	7440-43-9	7.5	2.5	2.5	4.3
	Chromium, Total	7440-47-3	160	30	36	180
	Copper, Total	7440-50-8	1720	50	270	270
	Lead, Total	7439-92-1	450	63	400	400
	Mercury, Total	7439-97-6	0.73	0.18	0.81	0.81
	Nickel, Total	7440-02-0	130	30	140	310
	Zinc, Total	7440-66-6	2480	109	2200	10000
Volatile Organics by EPA 5035						
	Tetrachloroethene	127-18-4	1.3	1.3	5.5	19
	Ethylbenzene	100-41-4	1	1	30	41
	Vinyl chloride	75-01-4	0.02	0.02	0.21	0.9
	trans-1,2-Dichloroethene	156-60-5	0.19	0.19	100	100
	Trichloroethene	79-01-6	0.47	0.47	10	21
	Xylenes, Total	1330-20-7	1.6	0.26	100	100
	cis-1,2-Dichloroethene	156-59-2	0.25	0.25	59	100
	Acetone	67-64-1	0.05	0.05	100	100
	1,2,4-Trimethylbenzene	95-63-6	3.6	3.6	47	52

NOTES:
1. Results are measured in mg/kg.
2. Results are compared to NYSDEC UUSCOs, NYSDEC PGWSCO. NYSDEC RSCO and NYSDEC RRSCOs.
🟨 = concentration exceeds UUSCO
🟧 = concentration exceeds RSCO
🟥 = concentration exceeds RRSCO
☐ =concentration exceeds PGWSCO

ABBREVIATIONS:
NYSDEC = New York State Department of Environmental Conservation.
UUSCO = NYSDEC Unrestricted Use Soil Cleanup Objectives (6 NYCRR 375-6 12/06).
RSCO = NYSDEC Residential Soil Cleanup Objectives
RRSCO = NYSDEC Restricted Use Soil Cleanup Objectives w/ CP-51 (1/10) (6 NYCRR 375-6 12/06).
PGWSCO = NYSDEC Protection of Groundwater Soil Cleanup Objectives (6 NYCRR Part 375 12/06)
mg/kg = Miligrams per kilogram.
Sample Depth is reported in feet below sidewalk surface

NYS Education Law
Unauthorized alterations or additions to this plan are a violation of section 7209 (2) of the New York State Education Law. Copies of this map not having the seal of the engineer shall not be valid.

REFERENCE
1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

NOTE:
THIS PLAN IS FOR LOCATING BORINGS & TEMP WELLS ONLY.
OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

Scale: 1"= 20'
0 10 20 40 60 80

rev	date	description	by

dwg by: APG
chk by: JL
scale: AS NOTED
date: 06/11/1025

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37 GRAMERCY PARK EAST, 38 GRAMERCY PARK NORTH
252 TO 258 3rd AVENUE
BLOCK 876, LOTS 25, 26, AND 29-32
NEW YORK, NEW YORK 10010

title: SOIL ANALYTICAL RESULTS AND EXCAVATION PLAN

job no. 13542
drawing no.
FIG-2.2

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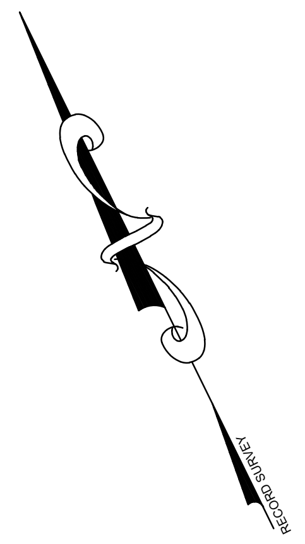
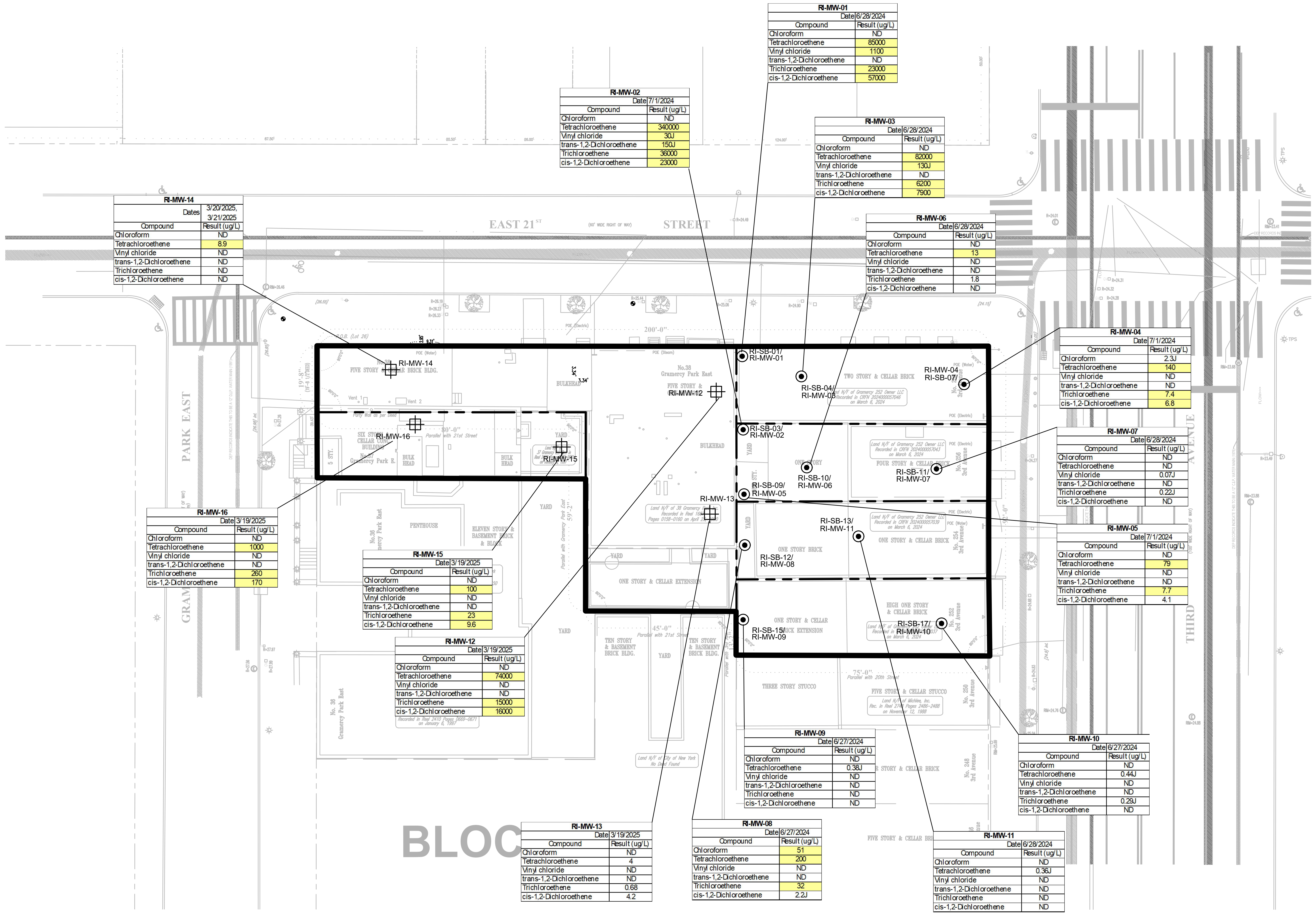




RI-MW-01

Date	6/28/2024
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	85000
Vinyl chloride	1100
trans-1,2-Dichloroethene	ND
Trichloroethene	23000
cis-1,2-Dichloroethene	57000

RI-MW-02

Date	7/1/2024
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	340000
Vinyl chloride	30J
trans-1,2-Dichloroethene	150J
Trichloroethene	36000
cis-1,2-Dichloroethene	23000

RI-MW-03

Date	6/28/2024
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	82000
Vinyl chloride	130J
trans-1,2-Dichloroethene	ND
Trichloroethene	6200
cis-1,2-Dichloroethene	7900

RI-MW-06

Date	6/28/2024
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	13
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	1.8
cis-1,2-Dichloroethene	ND

RI-MW-14

Dates	3/20/2025, 3/21/2025
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	8.9
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	ND
cis-1,2-Dichloroethene	ND

RI-MW-04

Date	7/1/2024
Compound	Result (ug/L)
Chloroform	2.3J
Tetrachloroethene	140
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	7.4
cis-1,2-Dichloroethene	6.8

RI-MW-07

Date	6/28/2024
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	ND
Vinyl chloride	0.07J
trans-1,2-Dichloroethene	ND
Trichloroethene	0.22J
cis-1,2-Dichloroethene	ND

RI-MW-05

Date	7/1/2024
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	79
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	7.7
cis-1,2-Dichloroethene	4.1

RI-MW-16

Date	3/19/2025
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	1000
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	260
cis-1,2-Dichloroethene	170

RI-MW-15

Date	3/19/2025
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	100
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	23
cis-1,2-Dichloroethene	9.6

RI-MW-12

Date	3/19/2025
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	74000
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	15000
cis-1,2-Dichloroethene	16000

RI-MW-09

Date	6/27/2024
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	0.38J
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	ND
cis-1,2-Dichloroethene	ND

RI-MW-10

Date	6/27/2024
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	0.44J
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	0.29J
cis-1,2-Dichloroethene	ND

RI-MW-13

Date	3/19/2025
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	4
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	0.68
cis-1,2-Dichloroethene	4.2

RI-MW-08

Date	6/27/2024
Compound	Result (ug/L)
Chloroform	51
Tetrachloroethene	200
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	32
cis-1,2-Dichloroethene	2.2J

RI-MW-11

Date	6/28/2024
Compound	Result (ug/L)
Chloroform	ND
Tetrachloroethene	0.36J
Vinyl chloride	ND
trans-1,2-Dichloroethene	ND
Trichloroethene	ND
cis-1,2-Dichloroethene	ND

LEGEND:

RI-MW-15 ⌖ - REMEDIAL INVESTIGATION MONITORING WELL & APPROXIMATE LOCATION

RI-SB-17/ RI-MW-10 ⊙ - COMBINED REMEDIAL INVESTIGATION SOIL SAMPLE NUMBER, MONITORING WELL NUMBER AND APPROXIMATE LOCATION

Analyte	Units	NYSDEC AWQS
Chloroform	ug/l	7
Tetrachloroethene	ug/l	5
Vinyl chloride	ug/l	2
trans-1,2-Dichloroethene	ug/l	5
Trichloroethene	ug/l	5
cis-1,2-Dichloroethene	ug/l	5

NOTES:

🟨 = Yellow highlight indicates the compound concentration exceeds the NYSDEC AWQS.

ABBREVIATIONS:

NYSDEC = New York State Department of Environmental Conservation
AWQS = Ambient Water Quality Standards
ug/l = Micrograms per liter
J- Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs)
BGS- Below Ground Surface

NOTE:
THIS PLAN IS FOR LOCATING BORINGS & TEMP WELLS ONLY.
OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

REFERENCE
1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

Scale: 1"= 20'
0 10 20 40 60 80

rev	date	description	by

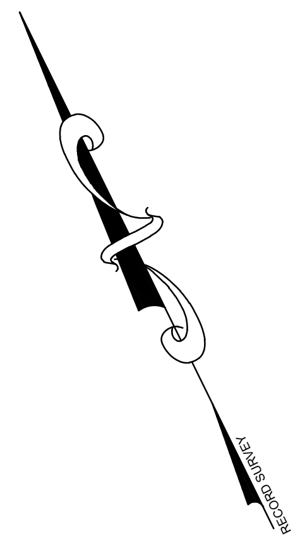
dwg by: APG
chk by: JL
scale: AS NOTED
date: 06/11/1025

SESI CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | SITE CIVIL
959 ROUTE 46E, 3RD FLOOR, PARSIPPANY, NJ 07054 PH: 973.808.9050

37 GRAMERCY PARK EAST, 38 GRAMERCY PARK NORTH
252 TO 258 3rd AVENUE
BLOCK 876, LOTS 25, 26, AND 29-32
NEW YORK, NEW YORK 10010

title:
GROUNDWATER SAMPLING EXCEEDANCES
CHLORINATED VOCs ONLY

job no. 13542
drawing no.
FIG-2.3A



LEGEND:

RI-MW-15 ⌖	REMEDIAL INVESTIGATION MONITORING WELL & APPROXIMATE LOCATION
RI-SB-17/ RI-MW-10 ⊙	COMBINED REMEDIAL INVESTIGATION SOIL SAMPLE NUMBER, MONITORING WELL NUMBER AND APPROXIMATE LOCATION
TW-1 ⌖	TEMPORARY WELL AND APPROXIMATE LOCATION

Analyte	Units	NYSDEC AWQS
Aluminum, Dissolved	ug/l	2000
Chromium, Dissolved	ug/l	50
Iron, Dissolved	ug/l	300
Lead, Dissolved	ug/l	25
Magnesium, Dissolved	ug/l	35000
Manganese, Dissolved	ug/l	300
Sodium, Dissolved	ug/l	20000
Dieldrin	ug/l	0.004
4,4'-DDE	ug/l	0.2
4,4'-DDD	ug/l	0.3
Chlordane	ug/l	0.05
PFOA	ug/l	0.0067
PFOS	ug/l	0.0027
1,4-Dichlorobenzene	ug/l	3
Bis(2-ethylhexyl)phthalate	ug/l	5
Phenol	ug/l	1
Acenaphthene	ug/l	20
Naphthalene	ug/l	10
Benzo(a)anthracene	ug/l	0.002
Benzo(b)fluoranthene	ug/l	0.002
Chrysene	ug/l	0.002
Phenanthrene	ug/l	50
Chloroform	ug/l	7
Tetrachloroethene	ug/l	5
Benzene	ug/l	1
Vinyl chloride	ug/l	2
trans-1,2-Dichloroethene	ug/l	5
Trichloroethene	ug/l	5
cis-1,2-Dichloroethene	ug/l	5
n-Butylbenzene	ug/l	5
sec-Butylbenzene	ug/l	5
Isopropylbenzene	ug/l	5
Naphthalene	ug/l	10
n-Propylbenzene	ug/l	5
1,2,4-Trimethylbenzene	ug/l	5
1,2,4,5-Tetramethylbenzene	ug/l	5

NOTES:

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ABBREVIATIONS:

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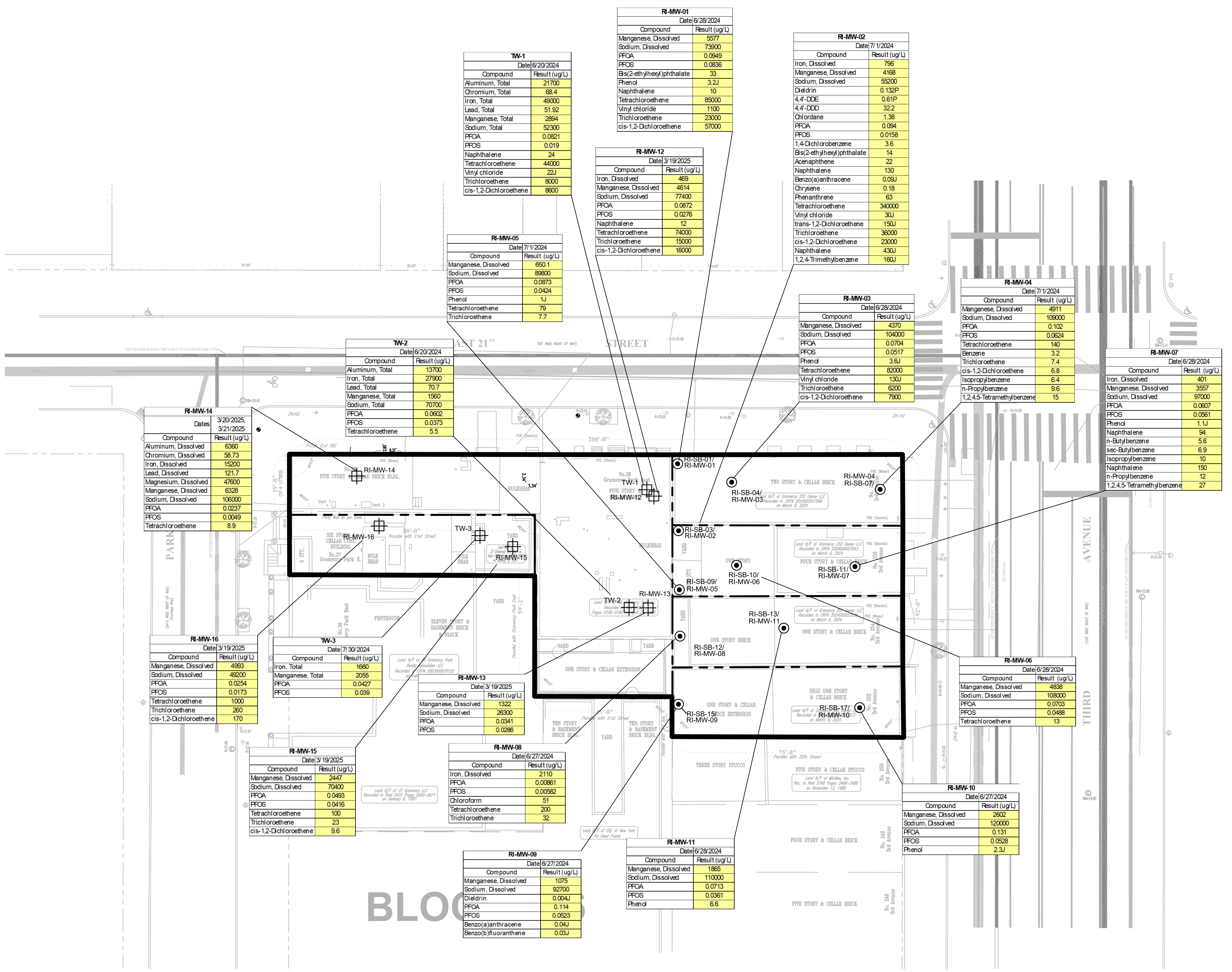

TW-1

Date	6/20/2024
Compound	Result (ug/L)
Aluminum, Total	21700
Chromium, Total	68.4
Iron, Total	49000
Lead, Total	51.92
Manganese, Total	2894
Sodium, Total	52300
PFOA	0.0821
PFOS	0.019
Naphthalene	24
Tetrachloroethene	44000
Vinyl chloride	22J
Trichloroethene	8000
cis-1,2-Dichloroethene	8600

RI-MW-01

Date	6/28/2024
Compound	Result (ug/L)
Manganese, Dissolved	5577
Sodium, Dissolved	73900
PFOA	0.0949
PFOS	0.0836
Bis(2-ethylhexyl)phthalate	33
Phenol	3.2J
Naphthalene	10
Tetrachloroethene	85000
Vinyl chloride	1100
Trichloroethene	23000
cis-1,2-Dichloroethene	57000

RI-MW-12

Date	3/19/2025
Compound	Result (ug/L)
Iron, Dissolved	469
Manganese, Dissolved	4614
Sodium, Dissolved	77400
PFOA	0.0872
PFOS	0.0276
Naphthalene	12
Tetrachloroethene	74000
Trichloroethene	15000
cis-1,2-Dichloroethene	16000

RI-MW-02

Date	7/1/2024
Compound	Result (ug/L)
Iron, Dissolved	796
Manganese, Dissolved	4168
Sodium, Dissolved	55200
Dieldrin	0.132P
4,4'-DDE	0.61P
4,4'-DDD	32.2
Chlordane	1.38
PFOA	0.094
PFOS	0.0158
1,4-Dichlorobenzene	3.6
Bis(2-ethylhexyl)phthalate	14
Acenaphthene	22
Naphthalene	130
Benzo(a)anthracene	0.09J
Chrysene	0.18
Phenanthrene	63
Tetrachloroethene	340000
Vinyl chloride	30J
trans-1,2-Dichloroethene	150J
Trichloroethene	36000
cis-1,2-Dichloroethene	23000
Naphthalene	430J
1,2,4-Trimethylbenzene	160J

RI-MW-05

Date	7/1/2024
Compound	Result (ug/L)
Manganese, Dissolved	650.1
Sodium, Dissolved	89800
PFOA	0.0873
PFOS	0.0424
Phenol	1J
Tetrachloroethene	79
Trichloroethene	7.7

TW-2

Date	6/20/2024
Compound	Result (ug/L)
Aluminum, Total	13700
Iron, Total	27900
Lead, Total	70.7
Manganese, Total	1560
Sodium, Total	70700
PFOA	0.0602
PFOS	0.0373
Tetrachloroethene	5.5

RI-MW-03

Date	6/28/2024
Compound	Result (ug/L)
Manganese, Dissolved	4370
Sodium, Dissolved	104000
PFOA	0.0704
PFOS	0.0517
Phenol	3.6J
Tetrachloroethene	82000
Vinyl chloride	130J
Trichloroethene	6200
cis-1,2-Dichloroethene	7900

RI-MW-04

Date	7/1/2024
Compound	Result (ug/L)
Manganese, Dissolved	4911
Sodium, Dissolved	109000
PFOA	0.102
PFOS	0.0624
Tetrachloroethene	140
Benzene	3.2
Trichloroethene	7.4
cis-1,2-Dichloroethene	6.8
Isopropylbenzene	6.4
n-Propylbenzene	9.6
1,2,4,5-Tetramethylbenzene	15

RI-MW-07

Date	6/28/2024
Compound	Result (ug/L)
Iron, Dissolved	401
Manganese, Dissolved	3557
Sodium, Dissolved	97000
PFOA	0.0607
PFOS	0.0561
Phenol	1.1J
Naphthalene	94
n-Butylbenzene	5.6
sec-Butylbenzene	6.9
Isopropylbenzene	10
Naphthalene	150
n-Propylbenzene	12
1,2,4,5-Tetramethylbenzene	27

RI-MW-14

Dates	3/20/2025, 3/21/2025
Compound	Result (ug/L)
Aluminum, Dissolved	6360
Chromium, Dissolved	58.73
Iron, Dissolved	15200
Lead, Dissolved	121.7
Magnesium, Dissolved	47600
Manganese, Dissolved	6328
Sodium, Dissolved	106000
PFOA	0.0237
PFOS	0.0049
Tetrachloroethene	8.9

RI-MW-16

Date	3/19/2025
Compound	Result (ug/L)
Manganese, Dissolved	4993
Sodium, Dissolved	49200
PFOA	0.0254
PFOS	0.0173
Tetrachloroethene	1000
Trichloroethene	260
cis-1,2-Dichloroethene	170

TW-3

Date	7/30/2024
Compound	Result (ug/L)
Iron, Total	1660
Manganese, Total	2055
PFOA	0.0427
PFOS	0.039

RI-MW-13

Date	3/19/2025
Compound	Result (ug/L)
Manganese, Dissolved	1322
Sodium, Dissolved	26300
PFOA	0.0341
PFOS	0.0286

RI-MW-06

Date	6/28/2024
Compound	Result (ug/L)
Manganese, Dissolved	4838
Sodium, Dissolved	108000
PFOA	0.0703
PFOS	0.0488
Tetrachloroethene	13

RI-MW-15

Date	3/19/2025
Compound	Result (ug/L)
Manganese, Dissolved	2447
Sodium, Dissolved	70400
PFOA	0.0493
PFOS	0.0416
Tetrachloroethene	100
Trichloroethene	23
cis-1,2-Dichloroethene	9.6

RI-MW-08

Date	6/27/2024
Compound	Result (ug/L)
Iron, Dissolved	2110
PFOA	0.00861
PFOS	0.00582
Chloroform	51
Tetrachloroethene	200
Trichloroethene	32

RI-MW-10

Date	6/27/2024
Compound	Result (ug/L)
Manganese, Dissolved	2602
Sodium, Dissolved	120000
PFOA	0.131
PFOS	0.0528
Phenol	2.3J

RI-MW-11

Date	6/28/2024
Compound	Result (ug/L)
Manganese, Dissolved	1865
Sodium, Dissolved	110000
PFOA	0.0713
PFOS	0.0361
Phenol	6.6

RI-MW-09

Date	6/27/2024
Compound	Result (ug/L)
Manganese, Dissolved	1075
Sodium, Dissolved	92700
Dieldrin	0.004J
PFOA	0.114
PFOS	0.0523
Benzo(a)anthracene	0.04J
Benzo(b)fluoranthene	0.03J

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0 10 20 40 60 80

rev	date	description	by

dwg by: APG
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title:
GROUNDWATER SAMPLING EXCEEDANCES
ALL ANALYTES

job no. 13542
drawing no.
FIG-2.3B

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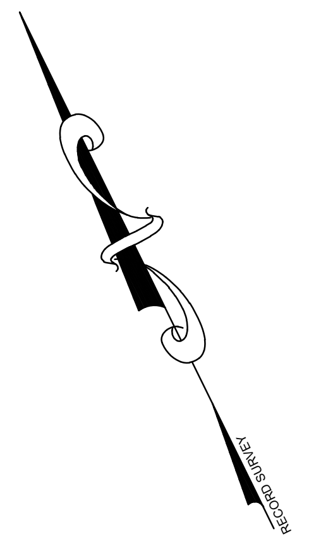

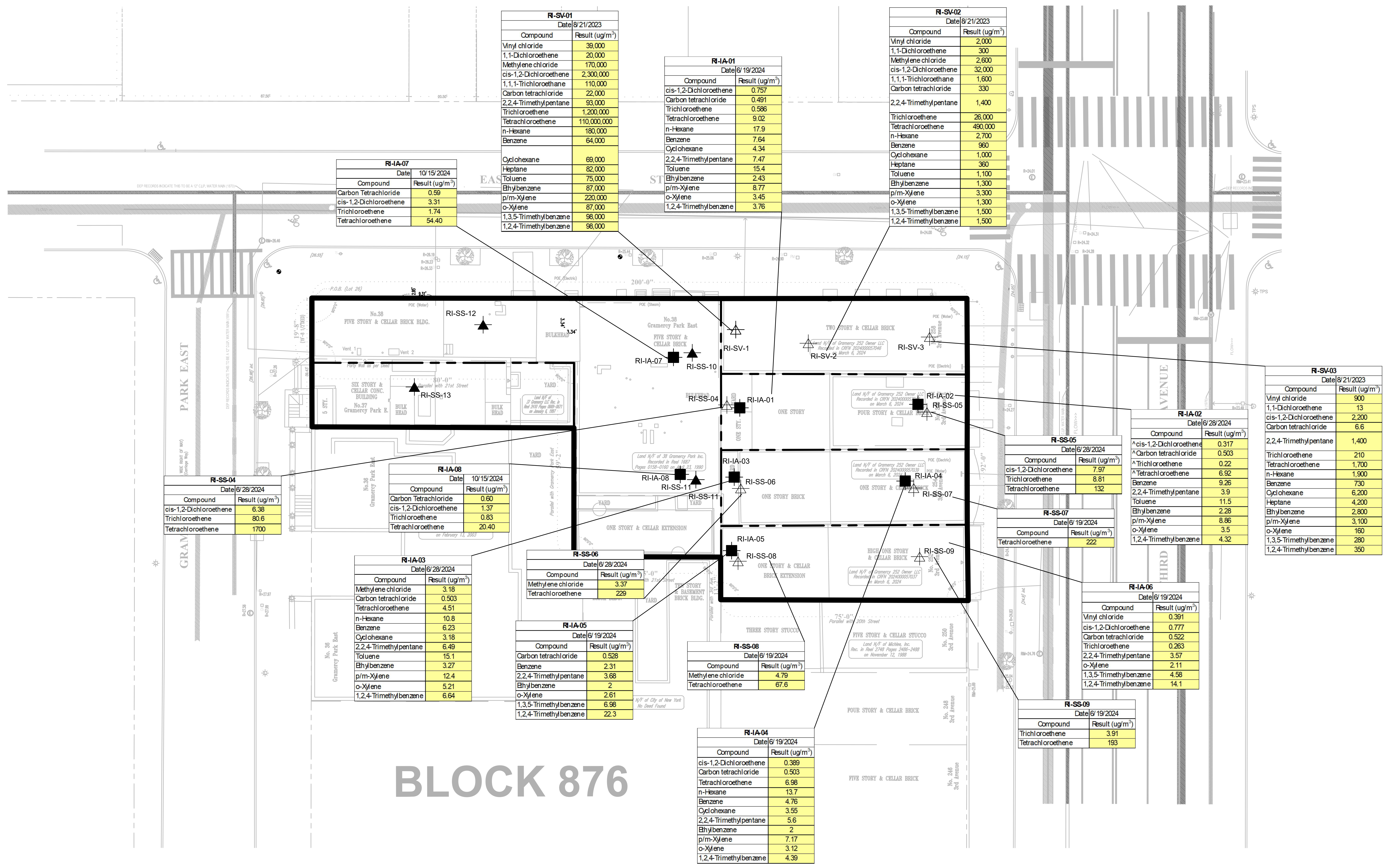

RI-SV-01

Compound	Result (ug/m^3)
Date	8/21/2023
Vinyl chloride	39,000
1,1-Dichloroethene	20,000
Methylene chloride	170,000
cis-1,2-Dichloroethene	2,300,000
1,1,1-Trichloroethane	110,000
Carbon tetrachloride	22,000
2,2,4-Trimethylpentane	93,000
Trichloroethene	1,200,000
Tetrachloroethene	110,000,000
n-Hexane	180,000
Benzene	64,000
Cyclohexane	69,000
Heptane	82,000
Toluene	75,000
Ethylbenzene	87,000
p/m-Xylene	220,000
o-Xylene	87,000
1,3,5-Trimethylbenzene	98,000
1,2,4-Trimethylbenzene	98,000

RI-IA-07

Compound	Result (ug/m^3)
Date	10/15/2024
Carbon Tetrachloride	0.59
cis-1,2-Dichloroethene	3.31
Trichloroethene	1.74
Tetrachloroethene	54.40

RI-IA-01

Compound	Result (ug/m^3)
Date	6/19/2024
cis-1,2-Dichloroethene	0.757
Carbon tetrachloride	0.491
Trichloroethene	0.586
Tetrachloroethene	9.02
n-Hexane	17.9
Benzene	7.64
Cyclohexane	4.34
2,2,4-Trimethylpentane	7.47
Toluene	15.4
Ethylbenzene	2.43
p/m-Xylene	8.77
o-Xylene	3.45
1,2,4-Trimethylbenzene	3.76

RI-SV-02

Compound	Result (ug/m^3)
Date	8/21/2023
Vinyl chloride	2,000
1,1-Dichloroethene	300
Methylene chloride	2,600
cis-1,2-Dichloroethene	32,000
1,1,1-Trichloroethane	1,600
Carbon tetrachloride	330
2,2,4-Trimethylpentane	1,400
Trichloroethene	26,000
Tetrachloroethene	490,000
n-Hexane	2,700
Benzene	960
Cyclohexane	1,000
Heptane	360
Toluene	1,100
Ethylbenzene	1,300
p/m-Xylene	3,300
o-Xylene	1,300
1,3,5-Trimethylbenzene	1,500
1,2,4-Trimethylbenzene	1,500

RI-SV-03

Compound	Result (ug/m^3)
Date	8/21/2023
Vinyl chloride	900
1,1-Dichloroethene	13
cis-1,2-Dichloroethene	2,200
Carbon tetrachloride	6.6
2,2,4-Trimethylpentane	1,400
Trichloroethene	210
Tetrachloroethene	1,700
n-Hexane	1,900
Benzene	730
Cyclohexane	6,200
Heptane	4,200
Ethylbenzene	2,800
p/m-Xylene	3,100
o-Xylene	160
1,3,5-Trimethylbenzene	280
1,2,4-Trimethylbenzene	350

RI-IA-02

Compound	Result (ug/m^3)
Date	6/28/2024
^cis-1,2-Dichloroethene	0.317
^Carbon tetrachloride	0.503
^Trichloroethene	0.22
^Tetrachloroethene	6.92
Benzene	9.26
2,2,4-Trimethylpentane	3.9
Toluene	11.5
Ethylbenzene	2.28
p/m-Xylene	8.86
o-Xylene	3.5
1,2,4-Trimethylbenzene	4.32

RI-SS-05

Compound	Result (ug/m^3)
Date	6/28/2024
cis-1,2-Dichloroethene	7.97
Trichloroethene	8.81
Tetrachloroethene	132

RI-SS-07

Compound	Result (ug/m^3)
Date	6/19/2024
Tetrachloroethene	222

RI-SS-04

Compound	Result (ug/m^3)
Date	6/28/2024
cis-1,2-Dichloroethene	6.38
Trichloroethene	80.6
Tetrachloroethene	1700

RI-IA-08

Compound	Result (ug/m^3)
Date	10/15/2024
Carbon Tetrachloride	0.60
cis-1,2-Dichloroethene	1.37
Trichloroethene	0.83
Tetrachloroethene	20.40

RI-IA-03

Compound	Result (ug/m^3)
Date	6/28/2024
Methylene chloride	3.18
Carbon tetrachloride	0.503
Tetrachloroethene	4.51
n-Hexane	10.8
Benzene	6.23
Cyclohexane	3.18
2,2,4-Trimethylpentane	6.49
Toluene	15.1
Ethylbenzene	3.27
p/m-Xylene	12.4
o-Xylene	5.21
1,2,4-Trimethylbenzene	6.64

RI-SS-06

Compound	Result (ug/m^3)
Date	6/28/2024
Methylene chloride	3.37
Tetrachloroethene	229

RI-IA-05

Compound	Result (ug/m^3)
Date	6/19/2024
Carbon tetrachloride	0.528
Benzene	2.31
2,2,4-Trimethylpentane	3.68
Ethylbenzene	2
o-Xylene	2.61
1,3,5-Trimethylbenzene	6.98
1,2,4-Trimethylbenzene	22.3

RI-SS-08

Compound	Result (ug/m^3)
Date	6/19/2024
Methylene chloride	4.79
Tetrachloroethene	67.6

RI-IA-04

Compound	Result (ug/m^3)
Date	6/19/2024
cis-1,2-Dichloroethene	0.389
Carbon tetrachloride	0.503
Tetrachloroethene	6.98
n-Hexane	13.7
Benzene	4.76
Cyclohexane	3.55
2,2,4-Trimethylpentane	5.6
Ethylbenzene	2
p/m-Xylene	7.17
o-Xylene	3.12
1,2,4-Trimethylbenzene	4.39

RI-IA-06

Compound	Result (ug/m^3)
Date	6/19/2024
Vinyl chloride	0.391
cis-1,2-Dichloroethene	0.777
Carbon tetrachloride	0.522
Trichloroethene	0.263
2,2,4-Trimethylpentane	3.57
o-Xylene	2.11
1,3,5-Trimethylbenzene	4.58
1,2,4-Trimethylbenzene	14.1

RI-SS-09

Compound	Result (ug/m^3)
Date	6/19/2024
Trichloroethene	3.91
Tetrachloroethene	193

LEGEND:

RI-SS-11 ▲	-	REMEDIAL INVESTIGATION SUB-SLAB SOIL VAPOR POINT & APPROX. LOCATION
RI-SV-1 △	-	REMEDIAL INVESTIGATION SOIL VAPOR POINT & APPROXIMATE LOCATION

Analyte	NY IAC-A	NY IAC-B	NY IAC-C	NY IAC-D	NY IAC-E	NY IAC-F	NY SSC-A	NY SSC-B	NY SSC-C	NY SSC-D	NY SSC-E	NY SSC-F
Vinyl chloride			0.2						6			
1,1-Dichloroethene	0.2						6					
cis-1,2-Dichloroethene	0.2						6					
n-Hexane					6						200	
Benzene				2						60		
Cyclohexane				2						60		
Trichloroethene	0.2						6					
2,2,4-Trimethylpentane				2						60		
Heptane					6						200	
Toluene						10						300
Tetrachloroethene		3						100				
Ethylbenzene				2						60		
p/m-Xylene					6						200	
o-Xylene				2						60		
1,3,5-Trimethylbenzene				2						60		
1,2,4-Trimethylbenzene				2						60		

NOTES:

1. Results are measured in ug/m3.
2. Results are compared to NYSDOH Soil Vapor/Indoor Air Decision Matrices

ABBREVIATIONS:

NY-IAC-A: New York DOH Matrix A Indoor Air Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-IAC-B: New York DOH Matrix B Indoor Air Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-IAC-C: New York DOH Matrix C Indoor Air Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-IAC-D: New York DOH Matrix D Indoor Air Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated February 2024.
NY-IAC-E: New York DOH Matrix E Indoor Air Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated February 2024.
NY-IAC-F: New York DOH Matrix E Indoor Air Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated February 2024.
NY-SSC-A: New York DOH Matrix A Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-SSC-B: New York DOH = concentration exceeds Sub-slab lowest value
NY-SSC-C: New York DOH Matrix C Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-SSC-D: New York DOH Matrix D Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated February 202
NY-SSC-E: New York DOH Matrix E Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated February 202
NY-SSC-F: New York DOH Matrix F Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated February 202

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Scale: 1"= 20'
0 10 20 40 60 80

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rev | date | description | by

dwg by: APG
chk by: JL
scale: AS NOTED
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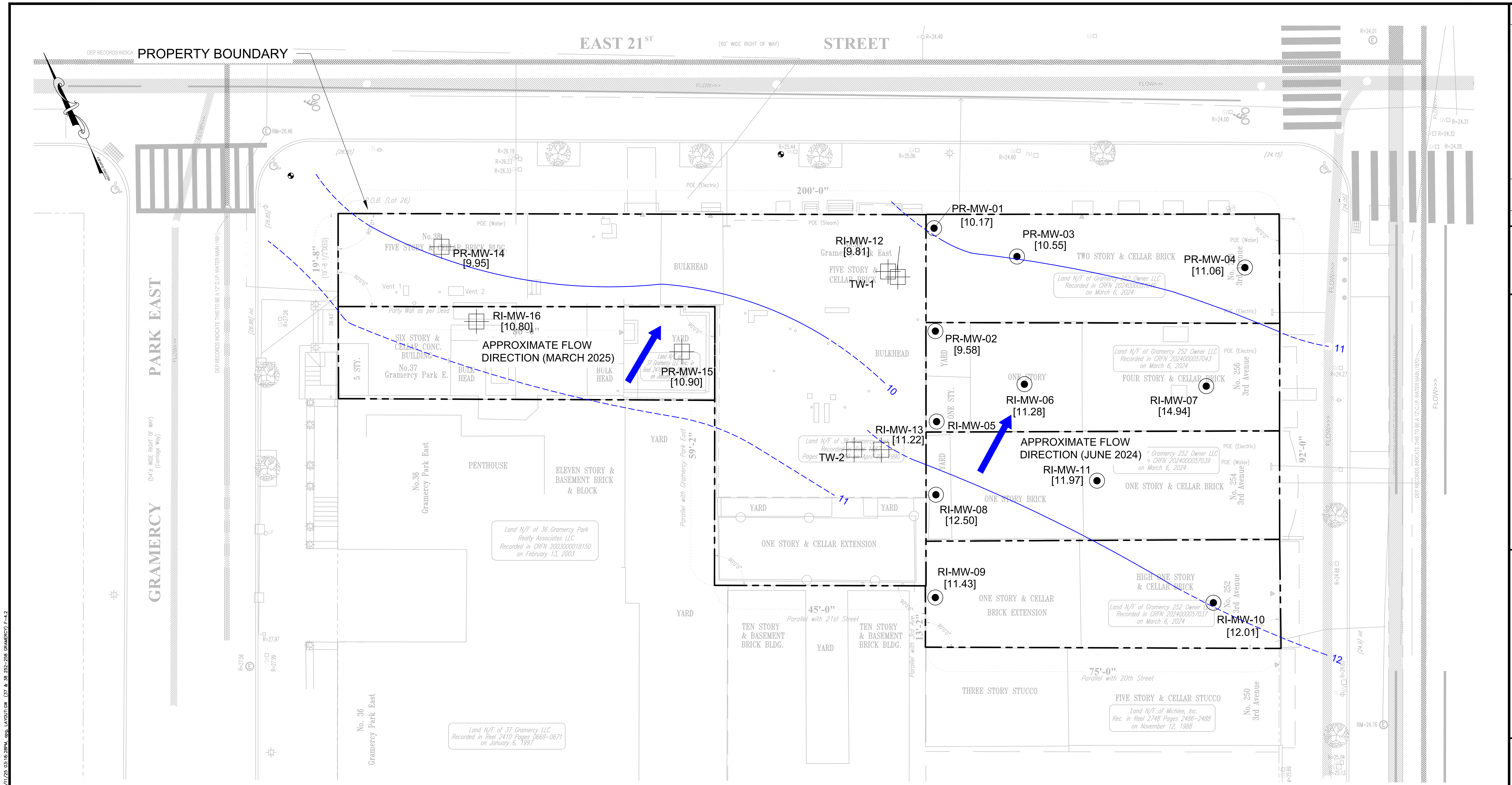
title:
SUB-SLAB SOIL VAPOR CONCENTRATIONS

job no. 13542
drawing no.
FIG-2.4



LEGEND:

RI-MW-15 ⌗	-	REMEDIAL INVESTIGATION MONITORING WELL & APPROXIMATE LOCATION
RI-SB-17/ RI-MW-10 ⊙	-	APPROXIMATE LOCATION OF REMEDIAL INVESTIGATION MONITORING WELL USED FOR JUNE 2024 FLOW DIRECTION
➡	-	GROUNDWATER FLOW DIRECTION
~ 10 ~	-	INFERRED GW CONTOURS

NOTE:
1. THIS PLAN IS FOR LOCATING BORINGS, TEMP WELLS AND SOIL VAPOR POINTS ONLY. OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.
2. GROUNDWATER LEVELS ELEVATIONS CALCULATED USING DEPTH TO WATER MEASUREMENTS AND APPROXIMATED ELEVATIONS.

REFERENCE
1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

Scale: 1"= 10'
0 5 10 20 30 40

rev	date	description	by

dwg by: AW
chk by: JL
scale: AS NOTED
date: 06/11/2025

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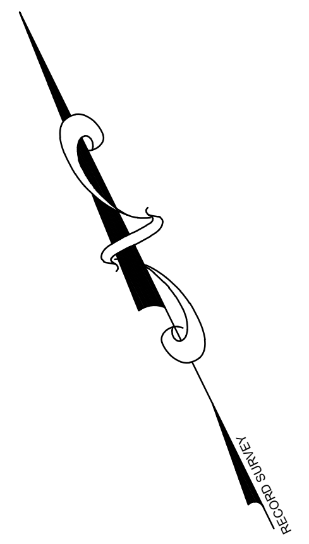
37 GRAMERCY PARK EAST, 38 GRAMERCY PARK NORTH
252 TO 258 3rd AVENUE
BLOCK 876, LOTS 25, 26, AND 29-32
NEW YORK, NEW YORK 10010

title:
GROUNDWATER CONTOUR PLAN AND
INFERRED FLOW DIRECTION

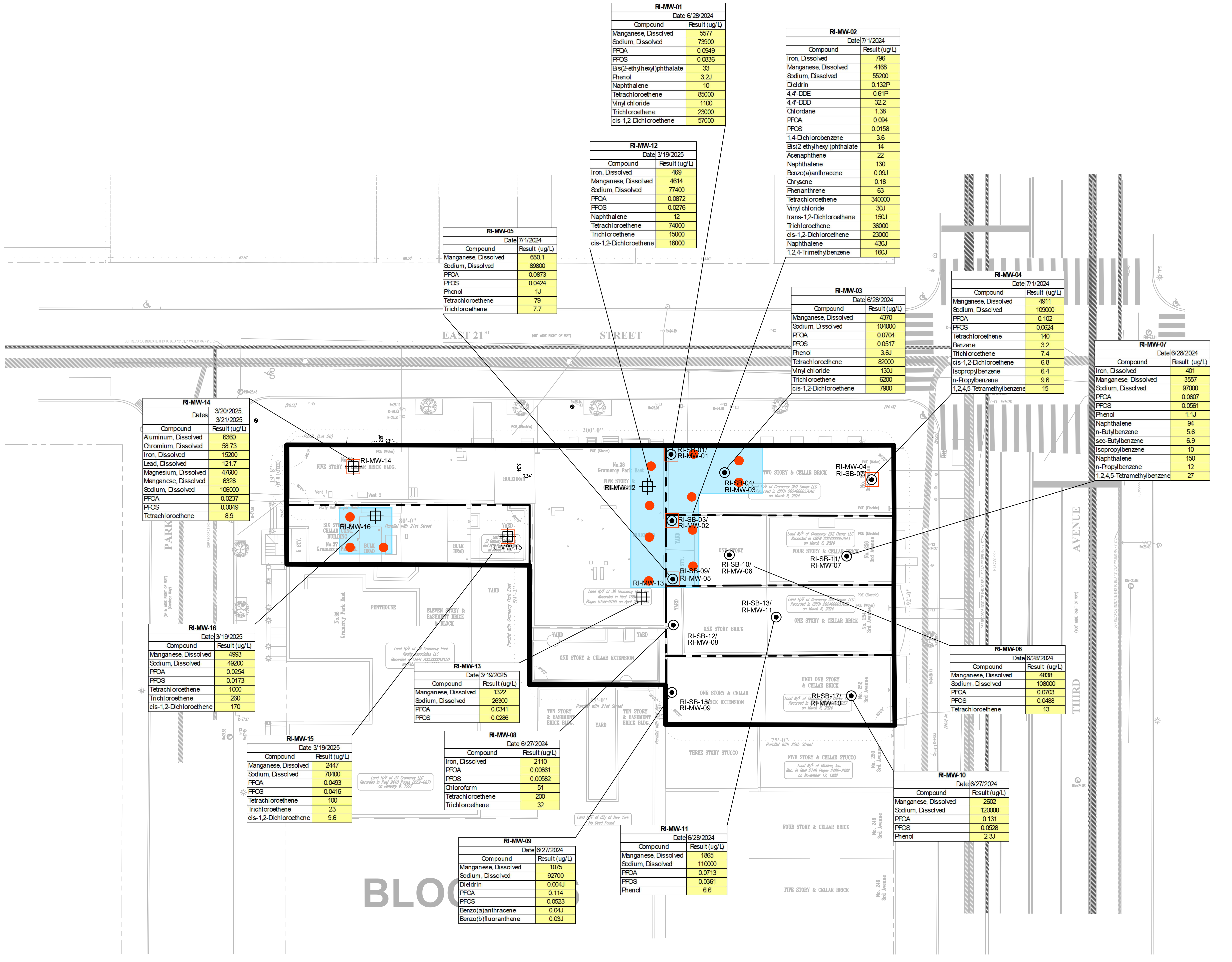
job no. 13542
drawing no.

FIG 2.5



LEGEND:

RI-MW-15 ⌖	-	REMEDIAL INVESTIGATION MONITORING WELL & APPROXIMATE LOCATION
RI-SB-17/ RI-MW-10 ⦿	-	COMBINED REMEDIAL INVESTIGATION SOIL SAMPLE NUMBER, MONITORING WELL NUMBER AND APPROXIMATE LOCATION
●	-	INJECTION WELL AND APPROXIMATE LOCATION
▭	-	SOURCE ZONE AREA
☐	-	POST-REMEDIATION WELLS



RI-MW-01

Date	6/28/2024
Compound	Result (ug/L)
Manganese, Dissolved	5577
Sodium, Dissolved	73900
PFOA	0.0949
PFOS	0.0836
Bis(2-ethylhexyl)phthalate	33
Phenol	3.2J
Naphthalene	10
Tetrachloroethene	85000
Vinyl chloride	1100
Trichloroethene	23000
cis-1,2-Dichloroethene	57000

RI-MW-02

Date	7/1/2024
Compound	Result (ug/L)
Iron, Dissolved	796
Manganese, Dissolved	4168
Sodium, Dissolved	55200
Dieldrin	0.132P
4,4'-DDE	0.61P
4,4'-DDD	32.2
Chlordane	1.38
PFOA	0.094
PFOS	0.0158
1,4-Dichlorobenzene	3.6
Bis(2-ethylhexyl)phthalate	14
Acenaphthene	22
Naphthalene	130
Benzo(a)anthracene	0.09J
Chrysene	0.18
Phenanthrene	63
Tetrachloroethene	340000
Vinyl chloride	30J
trans-1,2-Dichloroethene	150J
Trichloroethene	36000
cis-1,2-Dichloroethene	23000
Naphthalene	430J
1,2,4-Trimethylbenzene	160J

RI-MW-12

Date	3/19/2025
Compound	Result (ug/L)
Iron, Dissolved	469
Manganese, Dissolved	4614
Sodium, Dissolved	77400
PFOA	0.0872
PFOS	0.0276
Naphthalene	12
Tetrachloroethene	74000
Trichloroethene	15000
cis-1,2-Dichloroethene	16000

RI-MW-05

Date	7/1/2024
Compound	Result (ug/L)
Manganese, Dissolved	650.1
Sodium, Dissolved	89800
PFOA	0.0873
PFOS	0.0424
Phenol	1J
Tetrachloroethene	79
Trichloroethene	7.7

RI-MW-03

Date	6/28/2024
Compound	Result (ug/L)
Manganese, Dissolved	4370
Sodium, Dissolved	104000
PFOA	0.0704
PFOS	0.0517
Phenol	3.6J
Tetrachloroethene	82000
Vinyl chloride	130J
Trichloroethene	6200
cis-1,2-Dichloroethene	7900

RI-MW-04

Date	7/1/2024
Compound	Result (ug/L)
Manganese, Dissolved	4911
Sodium, Dissolved	109000
PFOA	0.102
PFOS	0.0624
Tetrachloroethene	140
Benzene	3.2
Trichloroethene	7.4
cis-1,2-Dichloroethene	6.8
Isopropylbenzene	6.4
n-Propylbenzene	9.6
1,2,4,5-Tetramethylbenzene	15

RI-MW-07

Date	6/28/2024
Compound	Result (ug/L)
Iron, Dissolved	401
Manganese, Dissolved	3557
Sodium, Dissolved	97000
PFOA	0.0607
PFOS	0.0561
Phenol	1.1J
Naphthalene	94
n-Butylbenzene	5.6
sec-Butylbenzene	6.9
Isopropylbenzene	10
Naphthalene	150
n-Propylbenzene	12
1,2,4,5-Tetramethylbenzene	27

RI-MW-14

Dates	3/20/2025, 3/21/2025
Compound	Result (ug/L)
Aluminum, Dissolved	6360
Chromium, Dissolved	58.73
Iron, Dissolved	15200
Lead, Dissolved	121.7
Magnesium, Dissolved	47600
Manganese, Dissolved	6328
Sodium, Dissolved	106000
PFOA	0.0237
PFOS	0.0049
Tetrachloroethene	8.9

RI-MW-16

Date	3/19/2025
Compound	Result (ug/L)
Manganese, Dissolved	4993
Sodium, Dissolved	49200
PFOA	0.0254
PFOS	0.0173
Tetrachloroethene	1000
Trichloroethene	260
cis-1,2-Dichloroethene	170

RI-MW-13

Date	3/19/2025
Compound	Result (ug/L)
Manganese, Dissolved	1322
Sodium, Dissolved	26300
PFOA	0.0341
PFOS	0.0286

RI-MW-15

Date	3/19/2025
Compound	Result (ug/L)
Manganese, Dissolved	2447
Sodium, Dissolved	70400
PFOA	0.0493
PFOS	0.0416
Tetrachloroethene	100
Trichloroethene	23
cis-1,2-Dichloroethene	9.6

RI-MW-08

Date	6/27/2024
Compound	Result (ug/L)
Iron, Dissolved	2110
PFOA	0.00861
PFOS	0.00582
Chloroform	51
Tetrachloroethene	200
Trichloroethene	32

RI-MW-06

Date	6/28/2024
Compound	Result (ug/L)
Manganese, Dissolved	4838
Sodium, Dissolved	108000
PFOA	0.0703
PFOS	0.0488
Tetrachloroethene	13

RI-MW-10

Date	6/27/2024
Compound	Result (ug/L)
Manganese, Dissolved	2602
Sodium, Dissolved	120000
PFOA	0.131
PFOS	0.0528
Phenol	2.3J

RI-MW-11

Date	6/28/2024
Compound	Result (ug/L)
Manganese, Dissolved	1865
Sodium, Dissolved	110000
PFOA	0.0713
PFOS	0.0361
Phenol	6.6

RI-MW-09

Date	6/27/2024
Compound	Result (ug/L)
Manganese, Dissolved	1075
Sodium, Dissolved	92700
Dieldrin	0.004J
PFOA	0.114
PFOS	0.0523
Benzo(a)anthracene	0.04J
Benzo(b)fluoranthene	0.03J

Analyte	Units	NYSDEC AWQS
Aluminum, Dissolved	ug/l	2000
Chromium, Dissolved	ug/l	50
Iron, Dissolved	ug/l	300
Lead, Dissolved	ug/l	25
Magnesium, Dissolved	ug/l	35000
Manganese, Dissolved	ug/l	300
Sodium, Dissolved	ug/l	20000
Dieldrin	ug/l	0.004
4,4'-DDE	ug/l	0.2
4,4'-DDD	ug/l	0.3
Chlordane	ug/l	0.05
PFOA	ug/l	0.0067
PFOS	ug/l	0.0027
1,4-Dichlorobenzene	ug/l	3
Bis(2-ethylhexyl)phthalate	ug/l	5
Phenol	ug/l	1
Acenaphthene	ug/l	20
Naphthalene	ug/l	10
Benzo(a)anthracene	ug/l	0.002
Benzo(b)fluoranthene	ug/l	0.002
Chrysene	ug/l	0.002
Phenanthrene	ug/l	50
Chloroform	ug/l	7
Tetrachloroethene	ug/l	5
Benzene	ug/l	1
Vinyl chloride	ug/l	2
trans-1,2-Dichloroethene	ug/l	5
Trichloroethene	ug/l	5
cis-1,2-Dichloroethene	ug/l	5
n-Butylbenzene	ug/l	5
sec-Butylbenzene	ug/l	5
Isopropylbenzene	ug/l	5
Naphthalene	ug/l	10
n-Propylbenzene	ug/l	5
1,2,4-Trimethylbenzene	ug/l	5
1,2,4,5-Tetramethylbenzene	ug/l	5

NOTES:

▭ = Yellow highlight indicates the compound concentration exceeds the NYSDEC AWQS.

ABBREVIATIONS:

NYSDEC = New York State Department of Environmental Conservation
AWQS = Ambient Water Quality Standards
ug/l = Micrograms per liter
J- Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs
BGS- Below Ground Surface

NOTE:
THIS PLAN IS FOR LOCATING BORINGS & TEMP WELLS ONLY.
OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

REFERENCE
1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

Scale: 1"= 20'
0 10 20 40 60 80

rev	date	description	by

dwg by: APG
chk by: JL
scale: AS NOTED
date: 06/11/1025

SESI CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | SITE CIVIL
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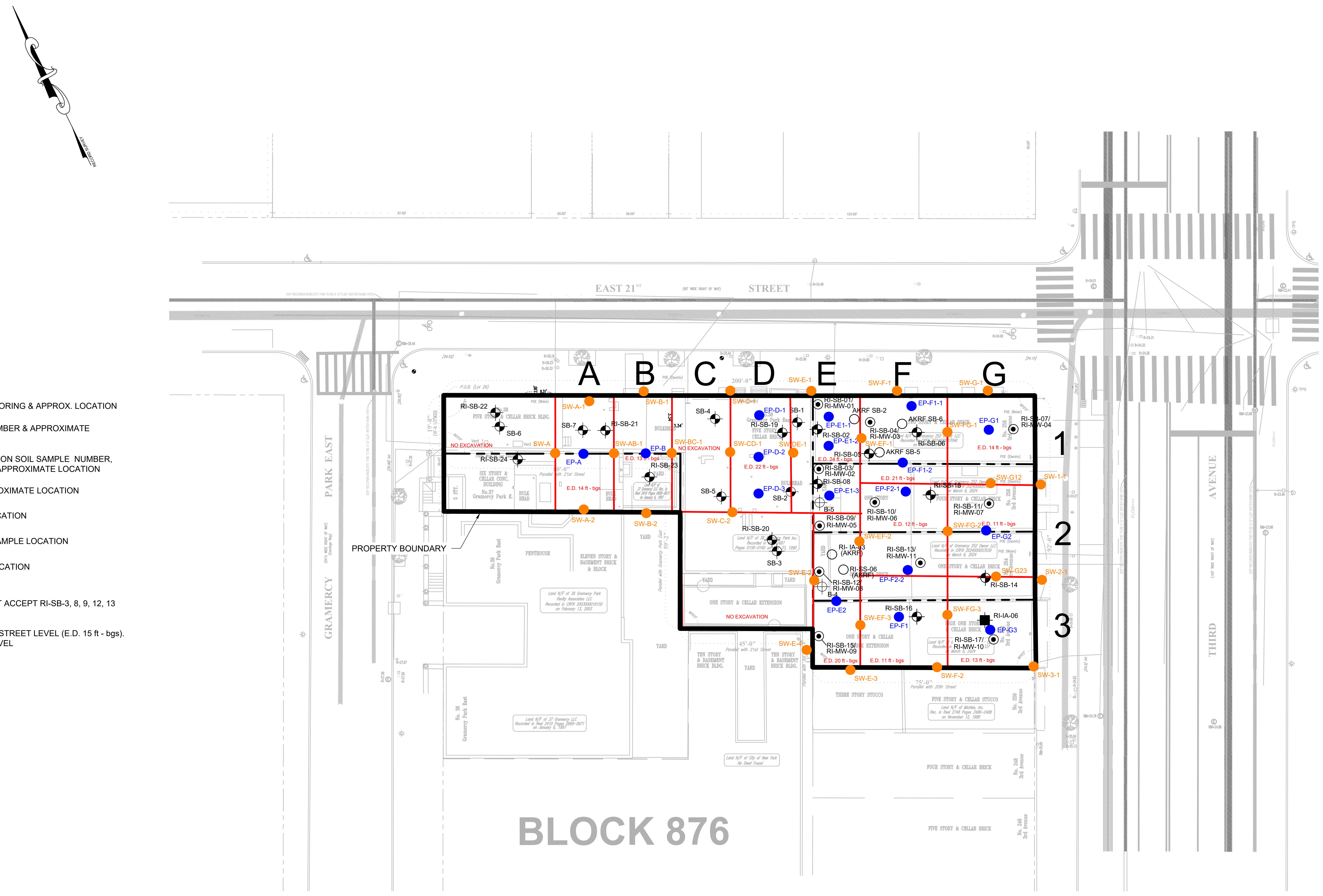
37 GRAMERCY PARK EAST, 38 GRAMERCY PARK NORTH
252 TO 258 3rd AVENUE
BLOCK 876, LOTS 25, 26, AND 29-32
NEW YORK, NEW YORK 10010

title:
ANTICIPATED GROUNDWATER
TREATMENT PLAN

job no. 13542
drawing no.
FIG-5.1



LEGEND:

RI-SB-21 ⊕	-	REMEDIAL INVESTIGATION SOIL BORING & APPROX. LOCATION
B-3 ⊕	-	GEOTECHNICAL SOIL BORING NUMBER & APPROXIMATE LOCATION
RI-SB-17/ RI-MW-10 ⊙	-	COMBINED REMEDIAL INVESTIGATION SOIL SAMPLE NUMBER, MONITORING WELL NUMBER AND APPROXIMATE LOCATION
AKRF SB-5 ○	-	AKRF BORING NUMBER AND APPROXIMATE LOCATION
SB-2 ⊕	-	SOIL BORING & APPROXIMATE LOCATION
EP-E1 ●	-	PROPOSED ENDPOINT BOTTOM SAMPLE LOCATION
SW-A-1 ●	-	PROPOSED SIDEWALL SAMPLE LOCATION

NOTES:

1. ALL BORINGS ADVANCED FROM BASEMENT ACCEPT RI-SB-3, 8, 9, 12, 13 (ADVANCED FROM STREET LEVEL).
2. ALL DEPTHS ARE REMEDIATION DEPTHS.
3. ALL EXCAVATION DEPTHS IN FEET BELOW STREET LEVEL (E.D. 15 ft - bgs).
4. BASEMENT DEPTH IS 8 ft FROM STREET LEVEL

N:\ACAD\13542\CAD\GEOTECH\LOCATION PLANS\13542.DWG.DATA MAPS.DWG 06/11/25 01:46:19PM, apg, LAYOUT:DATA 1

REFERENCE

1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

NOTE:
THIS PLAN IS FOR LOCATING BORINGS & TEMP WELLS ONLY.
OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

Scale: 1"= 20'
0 10 20 40 60 80

rev	date	description	by

dwg by: APG
chk by: JL
scale: AS NOTED
date: 06/11/1025

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37 GRAMERCY PARK EAST, 38 GRAMERCY PARK NORTH
252 TO 258 3rd AVENUE
BLOCK 876, LOTS 25, 26, AND 29-32
NEW YORK, NEW YORK 10010

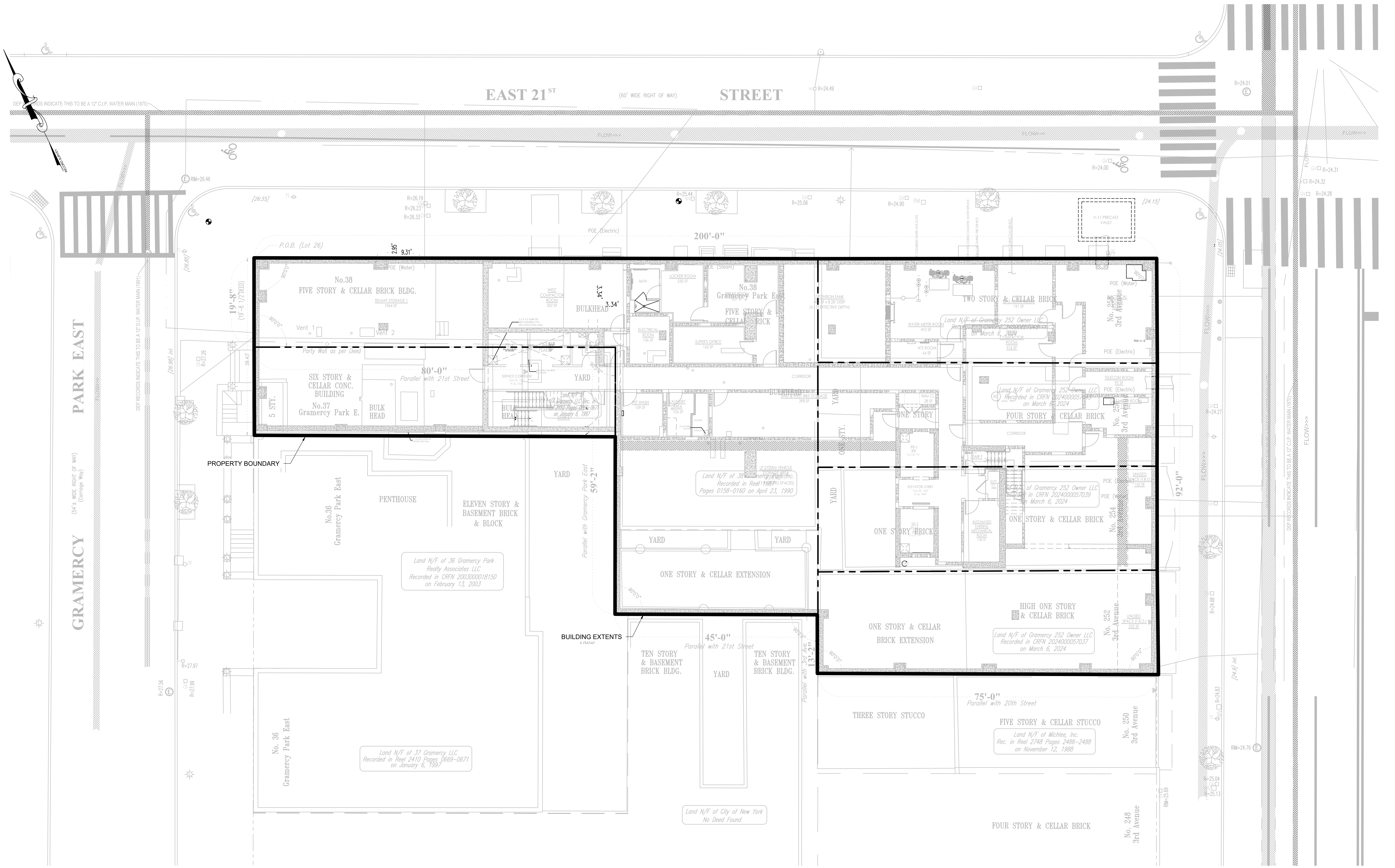
title:
EXCAVATION PLAN WITH ENDPOINT AND SIDEWALL SAMPLES

job no. 13542
drawing no.

FIG-5.2

Appendix A:

Conceptual Redevelopment Plans



NYS Education Law
Unauthorized alterations or additions to this plan are a violation of section 7209 (2) of the New York State Education Law. Copies of this map not having the seal of the engineer shall not be valid.

REFERENCE
1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

NOTE:
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OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

N:\ACAD\13542\CAD\GEOTECH\[SS]\13542.DWG.SOIL_BORING_LOCATION_PLAN -37-38 - V2.DWG 05/29/25 05:26:24PM, pinnacle, LAYOUT:SOIL RESULTS AND EXCAV PLAN (37-38 252-258 GRAMERCY) F 2.4

rev	date	description	by

dwg by: AW
chk by: JL
scale: AS NOTED
date: 04/07/2025

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37 GRAMERCY PARK EAST, 38 GRAMERCY PARK NORTH
252 TO 258 3rd AVENUE
BLOCK 876, LOTS 25, 26, AND 29-32
NEW YORK, NEW YORK 10010

title:
PROPOSED BUILDING FOUNDATION

job no. 13542
drawing no.
FIG-2.0

Appendix B:

Health and Safety Plan

SESI
CONSULTING ENGINEERS

Geotechnical
Environmental
Site Civil

959 Route 46E, Fl 3, Ste 300
Parsippany, NJ 07054
973.808.9050
www.sesi.org

Health and Safety Report

For:
252 Third Avenue
New York, New York 10003
BCP# C231154

Prepared for:

Gramercy 252 Owner, LLC

SESI Project No:
13542

Date:
April 2025

SITE-SPECIFIC HEALTH AND SAFETY PLAN

For

252 Third Avenue
New York, New York 10003
BCP# C231154

Prepared by: ____________________ Date: TBD

____

James Vander Vliet, P.E., LSRP
SESI- Sr. Project Manager

Approved by: ____________________ Date: TBD

____

Fuad Dahan. P.E., PhD.
SESI-Principal

Table of Contents

FIGURES

TABLES

ATTACHMENTS

Disclaimer: This Health and Safety Plan (HASP) is based upon information provided [and, if applicable, conditions discovered during a site visit], and is limited by the project scope.

The HASP should be periodically reviewed and updated based on a number of factors, including but not limited to: (1) changes in applicable governmental requirements; (2) changes in procedures at the site; and (3) site conditions which were unknown to SESI Consulting Engineers (SESI) as of the time the HASP was prepared.

This HASP has been prepared for the sole and exclusive use of Client listed above, and may not be relied upon by any other person without the express written consent and authorization of SESI.

LIST OF ACRONYMS

Acronym	Definition
ACGIH	American Conference of Governmental Industrial Hygienists
COC	Contaminants(s) of Concern
CRZ	Contamination Reduction Zone
EMS	Emergency Medical Services
EZ	Exclusion Zone
FS	Field Supervisor
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan
HSM	Health and Safety Manager
LEL	Lower Explosive Limit
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise Reduction Rating
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PEL	Permissible Exposure Limit
PFD	Personal Flotation Device
PID	Photoionization Detector
PM	Project Manager
PO	Project Officer
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
RI	Remedial Investigation
SESI	SESI Consulting Engineers
SSO	Site Safety Officer
SVOC	Semi-Volatile Organic Compound
SZ	Support Zone
TLV	Threshold Limit Value
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 INTRODUCTION

1.1 OBJECTIVE

The objective of this Health and Safety Plan (HASP) is to provide a mechanism for establishing safe working conditions during activities at 252 Third Avenue, New York, New York (the Site). The safety organization, procedures, and protective equipment have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of injury, illness, or other hazardous incidents.

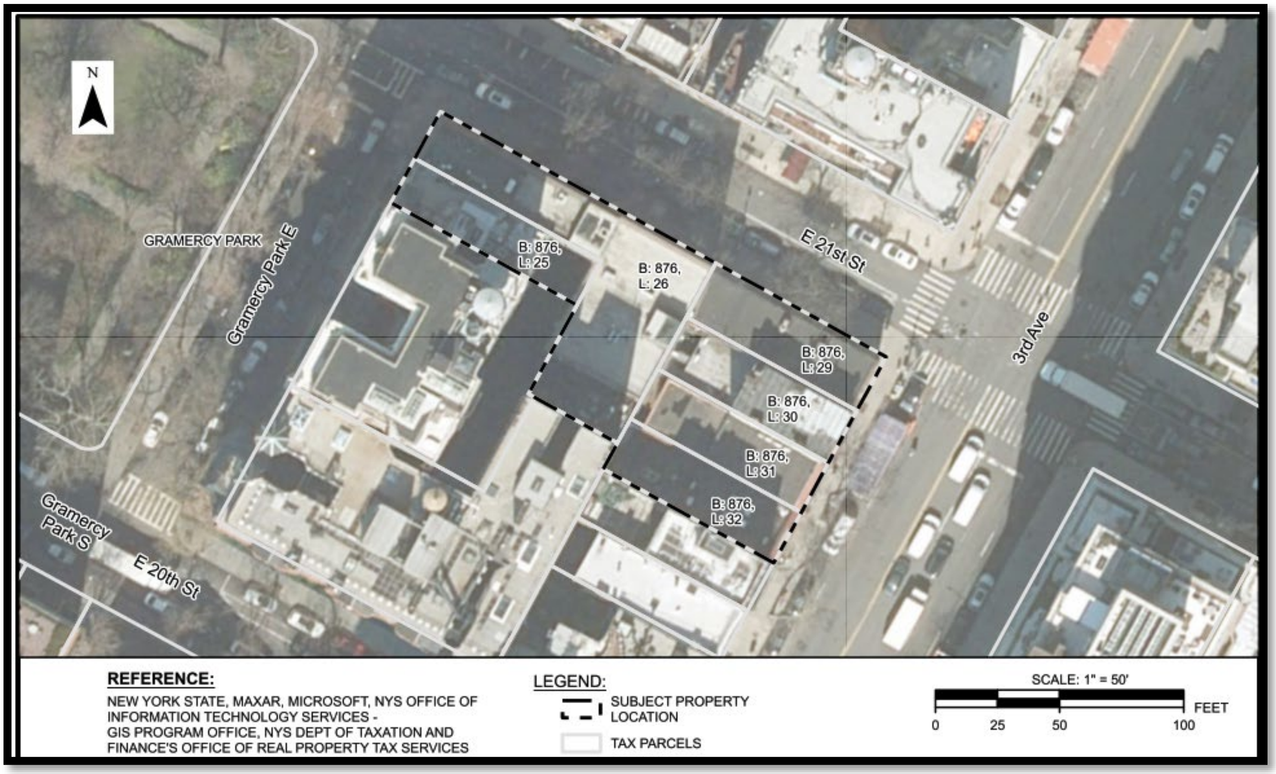
The HASP was written to meet the requirements of all applicable Federal, State, and local health and safety regulations, including 29 CFR 1910.120. The HASP is based on current knowledge regarding the specific chemical and physical hazards that are known or anticipated at the Site. This HASP is a dynamic document, for which changes and/or revisions may be realized as changes in scope and/or Site conditions are encountered. Should revised documents be produced, said revised documents will refer to the specific changes and why they were made.

All SESI employees are directed that all work must be performed in accordance with the SESI’s Generic HASP and all Occupation Safety and Health Administration (OSHA)-applicable regulations for the work activities required for the project. All project personnel are furthermore directed that they are not permitted to enter Permit Required Confined Spaces (as defined by OSHA).

1.2 SITE AND FACILITY DESCRIPTION

The Site is located at 252 Third Avenue in the Gramercy neighborhood of New York, New York, hereafter referred to as the “Site”. The approximately 0.32-acre Site is identified by the City of New York as Borough of Manhattan, Block 876, Lots 25, 26, 29, 30, 31, and 32. Currently, the Site consists of six (6) one- to five-story buildings on six (6) separate tax lots comprising an approximately 12,000-square-foot (sf) area. The northernmost portion of the Site (Lots 25 and 26) contain four- and five-story residential buildings with basements for storage and former retail commercial space. The easternmost lot (Lot 29) contains a two-story vacant building with full basement formerly utilized as a nail salon on the ground floor with former residential use on the second floor. The south adjacent lot (Lot 30) within the north-central portion of the Site contains a four-story mixed-use building with a full basement utilized as a bar on the first floor with vacant residential use on the second through fourth floors. The following south adjacent lot (Lot 31) within the south-central portion of the Site contains a two-story commercial building with a partial basement utilized as a dry cleaner (drop-off only). The southernmost portion of the Site (Lot 32) contains a single-story commercial building with a full basement utilized as a deli and grocery store. A Site Location Map is provided as **Figure 1.1.**

Figure 1.1 – Site Location Map



A subsurface investigation was conducted by EBI Consulting in February 2022 and a Phase II Environmental Site Assessment (ESA) was conducted by P.W. Grosser Consulting, Inc. in April 2022, and a Remedial Investigation (RI) was conducted by SESI Consulting Engineers in June and July 2024 on Lots 29 – 32. Additionally, a subsurface Phase II ESA was conducted by SESI in June and July 2024 on Lots 25 and 26, and partial indoor air sampling was conducted on Lot 26 in October 2024. The previous investigations identified elevated levels of chlorinated volatile organic compounds (VOCs), pesticides and metals in soil and groundwater, and chlorinated VOCs in soil vapor and indoor air on Lots 26, and 29 – 32. The RI will consist of the collection and laboratory analysis of soil, groundwater, soil vapor and indoor air samples to further define the nature and extent of contamination at the Site.

This HASP does not discuss routine health and safety issues common to general construction and excavation, including, but not, limited to slips, trips, falls, shoring, and other physical hazards.

1.3 POLICY STATEMENT

The policy of SESI Consulting Engineers (SESI) is to provide a safe and healthful work environment. No aspect of operations is of greater importance than injury and illness prevention. A fundamental principle of safety management is that all injuries, illnesses, and incidents are preventable. SESI will take every reasonable step to eliminate or control hazards in order to minimize the possibility of injury, illness, or incident.

This HASP prescribes the procedures that must be followed by SESI personnel during activities at the Site. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Health and Safety Manager (HSM). This document will be reviewed periodically by the HSM to ensure that it is current and technically correct. Any changes in Site conditions and/or the scope of work will require a review and modification to this HASP. Such changes will be completed in the form of an addendum or a revision to the plan.

The provisions of this plan are mandatory for all SESI personnel and are advisory for all contractors, and subcontractors assigned to the project***. Subcontractors will be responsible for preparing their own Site-specific HASPs that meet the basic requirements outlined in this HASP.*** All visitors to SESI work areas at the Site must abide by the requirements of this plan.

1.4 REFERENCES

This HASP complies with applicable Occupational Safety and Health Administration (OSHA) regulations, United States Environmental Protection Agency (USEPA) regulations, and SESI health and safety policies and procedures. This plan follows the guidelines established in the following:

- *Standard Operating Safety Guides*, USEPA (Publication 9285.1-03, June 1992).
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH, OSHA, USCG, USEPA (86116, October 1985).
- *Title 29 of the Code of Federal Regulations* (CFR), Part 1910.
- *Title 29 of the Code of Federal Regulations* (CFR), Part 1926.
- *Pocket Guide to Chemical Hazards*, DHHS, PHS, CDC, NIOSH (2004).
- *Threshold Limit Values*, ACGIH (2005).
- *Guide to Occupational Exposure Values*, ACGIH (2005).
- *Quick Selection Guide to Chemical Protective Clothing*, Forsberg, K. and S.Z. Mansdorf, 2nd Ed. (1993).

1.5 DEFINITIONS

The following definitions (listed alphabetically) are applicable to this HASP:

- *Contamination Reduction Zone (CRZ)* - Area between the exclusion zone and support zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.
- *Exclusion Zone (EZ)* - Any portions of the site where hazardous substances are, or are reasonably suspected to be present, and pose an exposure hazard to on-Site personnel.
- *Incident* - All losses, including first aid cases, injuries, illnesses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires, and business interruptions.
- *On-Site Personnel* - All SESI and subcontractors involved with the project.
- *Project* - All on-site work performed under the scope of work.
- *Site* - The area described in Section 1.2, Site and Facility Description, where the work is to be performed by SESI personnel and subcontractors.
- *Support Zone (SZ)* - All areas of the Site except the EZ and CRZ. The SZ surrounds the CRZ and EZ. Support equipment and break areas are located in this zone.
- *Subcontractor* - Includes contractor personnel hired by SESI.
- *Visitor* - All other personnel, except the on-Site personnel.
- *Work Area* - The portion of the Site where work activities are actively being performed. This area may change daily as work progresses and includes the SZ, CRZ, and EZ. If the work area is located in an area on the Site that is not contaminated, or suspected of being contaminated, the entire work area may be a SZ.

2.0 PROJECT SCOPE OF WORK

This HASP contains information for the following tasks that SESI is anticipated to conduct at the Site. Should additional and/or different tasks be identified, amendments to this HASP will be required to address these changed items.

- Mobilization;
- Soil, Groundwater, Vapor and Indoor Air Sampling; and
- Decontamination and Demobilization.

3.0 ROLES AND RESPONSIBILITIES

3.1 ALL PERSONNEL

All SESI project personnel must adhere to the procedures outlined in this HASP during the performance of their work. Each person is responsible for completing tasks safely and reporting any unsafe acts or conditions to their supervisor. No person may work in a manner that conflicts with these procedures. After due warnings, the PM will dismiss from the site any SESI employee or subcontractor who violates safety procedures.

All SESI project personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all SESI personnel will attend an initial hazard briefing prior to beginning work at the Site.

The roles of key safety personnel and subcontractors are outlined in the following sections. Key project personnel and contacts are summarized in **Table 3.1**.

3.2 KEY SAFETY PERSONNEL

3.2.1 PROJECT OFFICER (PO)

The PO is responsible for providing resources to assure project activities are completed in accordance with this HASP, and for meeting all regulatory and contractual requirements.

3.2.2 PROJECT MANAGER (PM)

The PM is responsible for verifying that project activities are completed in accordance with the requirements of this HASP. The PM is responsible for confirming that the Field Supervisor (FS) has the equipment, materials, and qualified personnel to fully implement the safety requirements of this HASP, and/or that subcontractors assigned to this project meet the requirements established by SESI. It is also the responsibility of the PM to:

- Consult with the HSM on Site health and safety issues;
- Verify that subcontractors meet health and safety requirements prior to commencing work;
- Verify that all incidents are thoroughly investigated;
- Approve, in writing, addenda or modifications of this HASP; and
- Suspend work or modify work practices, as necessary, for personal safety, protection of property, and regulatory compliance.

3.2.3 HEALTH AND SAFETY MANAGER (HSM)

The HSM or his designee has overall responsibility for the technical health and safety aspects of the project, including review and approval of this HASP. Inquiries regarding health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The HSM or his designee must approve changes or addenda to this HASP.

3.2.4 SITE SAFETY OFFICER (SSO)

The SSO is responsible for field health and safety issues, including the execution of this HASP. Questions in the field regarding health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The SSO will advise the PM on health and safety issues and will establish and coordinate the project air-monitoring program if one is deemed necessary (see Section 5.1, Air Monitoring). The SSO is the primary Site contact on health and safety matters. It is the responsibility of the SSO to:

- Provide on-Site technical assistance, if necessary;
- Participate in all accident/incident reports and ensure that they are reported to the HSM, client, and PM within 24 hours;
- Coordinate Site and personal air monitoring as required, including equipment maintenance and calibration;
- Conduct Site safety orientation training and safety meetings;
- Verify that project personnel have received the required physical examinations and medical certifications;
- Review Site activities with respect to compliance with this HASP;
- Maintain required health and safety documents and records; and
- Assist the FS in instructing field personnel on project hazards and protective procedures.

3.2.5 FIELD SUPERVISOR (FS)

The FS is responsible for implementing this HASP, including communicating requirements to on-Site personnel and subcontractors. The FS will be responsible for informing the PM of changes in the work plan, procedures, or Site conditions so that those changes may be addressed in this HASP. Other responsibilities are to:

- Consult with the SSO on Site health and safety issues;
- Stop work, as necessary, for personal safety, protection of property, and regulatory compliance;
- Obtain a Site map and determine and post routes to medical facilities and emergency telephone numbers;

- Notify local public emergency representatives (as appropriate) of the nature of the Site operations, and post their telephone numbers (i.e., local fire department personnel who would respond for a confined space rescue);
- Observe on-Site project personnel for signs of ill health effects;
- Investigate and report any incidents to the SSO;
- Verify that all on-Site personnel have had applicable training;
- Verify that on-Site personnel are informed of the physical, chemical, and biological hazards associated with the Site activities, and the procedures and protective equipment necessary to control the hazards; and
- Issue/obtain any required work permits (hot work, confined space, etc.).

3.2.6 FIELD PERSONNEL (FP)

All SESI field personnel are responsible for following the Health and Safety procedures specified in this HASP and work practices specified in applicable operation procedures. Some specific responsibilities include, but are not limited to:

- Reading and understanding the HASP;
- Reporting all accidents, incidents, injuries, or illnesses to the FS;
- Complying with the requests of the SSO;
- Immediately communicating newly identified hazards or noncompliance issues to the FS or SSO; and
- Stopping work in cases of immediate danger.

3.3 SUBCONTRACTORS

Subcontractors and their personnel must understand and comply with applicable regulations and Site requirements established in this HASP. Subcontractors will prepare their own Site-specific HASP that must be consistent with the requirements of this HASP.

All subcontractor personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating Site activities. All subcontractor personnel will attend an initial hazard briefing prior to beginning work at the Site. Additionally, on-Site subcontractor personnel must conduct daily Site safety meetings.

Subcontractors must designate individuals to function as the PM, HSM, SSO, and FS. In some firms the HSM to be carried out by the PM. This is acceptable provided the PM has the required knowledge, training, and experience to properly address all hazards associated with the work, and to prepare, approve, and oversee the execution of the Site-specific HASP. A subcontractor may designate the same person to perform the duties of both the SSO and the FS. However, depending on the level of complexity of a contractor's scope of work, it may be infeasible for one person to perform both functions satisfactorily.

3.4 STOP WORK AUTHORITY

Every SESI employee and subcontractor is empowered, expected, and has the responsibility to stop the work of another co-worker if the working conditions or behaviors are considered unsafe.

3.5 ALL ON-SITE PERSONNEL

All on-Site SESI personnel (including SESI subcontractors) must read and acknowledge their understanding of their respective HASPs before commencing work and abide by the requirements of the plans. All on-Site SESI personnel shall sign their HASP Acknowledgement Form following their review of their HASP.

All SESI project personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating Site activities. In addition, all on-Site personnel will attend an initial hazard briefing provided by the SSO prior to beginning work at the Site and conduct daily safety meetings thereafter.

On-Site personnel will immediately report the following to the FS or SSO:

- Personal injuries and illnesses no matter how minor;
- Unexpected or uncontrolled release of chemical substances;
- Symptoms of chemical exposure;
- Unsafe or hazardous situations;
- Unsafe or malfunctioning equipment;
- Changes in site conditions that may affect the health and safety of project personnel;
- Damage to equipment or property; and
- Situations or activities for which they are not properly trained.

3.6 VISITORS

All SESI personnel and subcontractors visiting the Site must check in with the FS. Visitors will be cautioned to avoid skin contact with surfaces, soils, groundwater, or other materials that may impacted or be suspected to be impacted by contaminants of concern (COCs).

Visitors requesting to observe work at the site must don appropriate personal protective equipment (PPE) prior to entry to the work area and must have the appropriate training and medical clearances to do so. If respiratory protective devices are necessary, visitors who wish to enter the work area must have been respirator-trained and fit tested for a respirator within the past 12 months.

Table 3.1 – Key Safety Personnel

SESI Personnel		
Role	**Name**	**Telephone No.**
Project Principal	Fuad Dahan, P.E., PhD	973-808-9050 x249
Project Manager (PM)	James Vander Vliet, P.E.	201.452.2735
Principal Engineer	Fuad Dahan, P.E., PhD	973-808-9050 x249
Remedial Action Project Manager	James Vander Vliet, P.E.	201.452.2735
Field Team Leader	Jeff Lamborn	973-600-7630 x308
Quality Assurance Officer	Joe Scardino	973-808-9050 x267
Field Personnel	TBD	

4.0 PERSONAL PROTECTIVE EQUIPMENT

4.1 LEVELS OF PROTECTION

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the levels of COCs and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level. A summary of the levels is presented in **Table 4.1**.

4.1.1 LEVEL D PROTECTION

The minimum level of protection that will be required of project personnel at the site will be Level D, which will be worn when site conditions or air monitoring indicates no inhalation hazard exists. The following equipment will be used:

- Work clothing as prescribed by weather;
- Steel toe work boots, meeting American National Standards Institute (ANSI) Z41;
- Safety glasses or goggles, meeting ANSI Z87;
- Leather work gloves and/or nitrile surgical gloves;
- Hard hat, meeting ANSI Z89, when falling object hazards are present;
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used); and

Personal floatation device (PFD) if working on or near the water.

4.1.2 MODIFIED LEVEL D PROTECTION

Modified Level D will be used when airborne contaminants are not present at levels of concern, but site activities present an increased potential for skin contact with contaminated materials. Modified Level D consists of:

- Nitrile gloves worn over nitrile surgical gloves;
- Latex/polyvinyl chloride (PVC) overboots when contact with COC-impacted media is anticipated;
- Steel toe work boots, meeting ANSI Z41;
- Safety glasses or goggles, meeting ANSI Z87;
- Face shield in addition to safety glasses or goggles when projectiles or splash hazards exist (e.g. during Power Washing activities);
- Hard hat, meeting ANSI Z89, when falling object hazards are present;
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used);
- Tyvek® suit (polyethylene coated Tyvek® suits for handling liquids) when body contact with COC-impacted media is anticipated; and
- PFD if working on or near the water.

4.1.3 LEVEL C PROTECTION

Level C protection will be required when the airborne concentration of COC reaches one-half of the OSHA Permissible Exposure Limit or ACGIH TLV. The following equipment will be used for Level C protection:

- Full-face, air-purifying respirator with combination organic vapor/HEPA cartridges;
- Polyethylene-coated Tyvek® suit, with ankles and cuffs taped to boots and gloves;
- Nitrile gloves worn over nitrile surgical gloves;
- Steel toe work boots, meeting ANSI Z41;
- Chemical-resistant boots with steel toes or latex/PVC overboots over steel toe boots;
- Hard hat, meeting ANSI Z89;
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used); and
- PFD if working on or near the water.

4.2 SELECTION OF PPE

Equipment for personal protection will be selected based on the potential for contact, site conditions, ambient air quality, and the judgment of supervising Site personnel and health and safety professionals. The PPE used will be chosen to be effective against the COCs present on the Site.

4.3 SITE RESPIRATOR PROTECTION PROGRAM

Respiratory protection is an integral part of employee health and safety at the Site due to potentially hazardous concentrations of airborne COCs. The Site respiratory protection program will consist of the following (as a minimum):

- All on-Site personnel who may use respiratory protection will have an assigned respirator.
- All on-Site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air-purifying respirator within the past 12 months. Documentation of the fit test must be provided to the SSO prior to commencement of work.
- All on-Site personnel who may use respiratory protection must within the past year have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the SSO, prior to commencement of Site work.
- Only cleaned, maintained, NIOSH-approved respirators will be used.
- If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, or when load-up or breakthrough occurs.
- Contact lenses are not to be worn when a respirator is worn.
- All on-Site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.

- Respirators will be inspected, and a negative pressure test performed prior to each use.

After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

4.4 USING PPE

Depending upon the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used. All personnel entering the EZ must put on the required PPE in accordance with the requirements of this HASP. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of COCs.

4.4.1 DONNING PROCEDURES

These procedures are mandatory only if Modified Level D or Level C PPE is used on the Site:

- Remove bulky outerwear. Remove street clothes and store in clean location;
- Put on work clothes or coveralls;
- Put on the required chemical protective coveralls;
- Put on the required chemical protective boots or boot covers;
- Tape the legs of the coveralls to the boots with duct tape;
- Put on the required chemical protective gloves;
- Tape the wrists of the protective coveralls to the gloves;
- Don the required respirator and perform appropriate fit check (Level C);
- Put hood or head covering over-head and respirator straps and tape hood to facepiece (Level C); and
- Don remaining PPE, such as safety glasses or goggles and hard hat.

When these procedures are instituted, one person must remain outside the work area to ensure that each person entering has the proper protective equipment.

4.4.2 DOFFING PROCEDURES

The following procedures are only mandatory if Modified Level D or Level C PPE is required for the Site. Whenever a person leaves the work area, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers;
- Clean reusable protective equipment;
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels;
- Wash hands, face, and neck (or shower if necessary);
- Proceed to clean area and dress in clean clothing; and
- Clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags, labeled for disposal. See Section 6.2, Decontamination, for detailed information on decontamination stations.

4.5 SELECTION MATRIX

The level of personal protection selected will be based on air monitoring of the work environment and an assessment by the FS and SSO of the potential for skin contact with COCs. The PPE selection matrix is presented in **Table 4.1** below. This matrix is based on information available at the time this plan was written. The Airborne Contaminant Action Levels in **Table 5.1**, Airborne Contaminant Action Levels, should be used to verify that the PPE prescribed in these matrices is appropriate.

Table 4.1 – PPE Selection Matrix

Task	Anticipated Level of Protection
Mobilization	Level D
Subsurface Intrusive Activities (Drilling)	Modified Level D/Level C
Chemical Sampling / Delineation	Modified Level D/Level C
Decontamination	Modified Level D
Demobilization	Level D

5.0 AIR AND NOISE MONITORING

5.1 AIR MONITORING

Air monitoring, sampling, and testing will be conducted to determine employee exposure to airborne constituents. The monitoring results will dictate work procedures and the selection of PPE. The SESI SSO will be responsible for defining appropriate air monitoring procedures and for utilizing the air monitoring results to determine appropriate procedures and PPE for project personnel. Air monitoring results should be recorded in field notebooks or on an air monitoring log (see Attachment 1 for a copy of the Air Monitoring Log). Any deviations from the procedures listed here should be documented and explained in the Air Monitoring Log.

The monitoring devices to be used are a PDR1000 particulate monitor (or equivalent) and a Rae Systems MultiRAE detector (PID with a 10.6 eV lamp/oxygen/LEL/hydrogen sulfide sensors). Colorimetric detector tubes or similar detecting devices may be utilized to estimate airborne concentrations of benzene and vinyl chloride and should be onsite during any activities that may result in elevated PID readings including drilling, excavating, and groundwater sampling.

Air monitoring will be conducted continuously with a 4-gas monitor to detect the %LEL, oxygen, carbon monoxide and hydrogen sulfide during drilling in areas where flammable vapors or gases are suspected. All work activity must stop where tests indicate the concentration of flammable vapors exceeds 10% of the LEL at a location with a potential ignition source. Such an area must be ventilated to reduce the concentration to an acceptable level.

5.2 NOISE MONITORING

Noise monitoring may be conducted as required. Hearing protection is mandatory for all employees in noise hazardous areas, such as around heavy equipment. As a general rule, sound levels that cause speech interference at normal conversation distance should require the use of hearing protection.

5.3 MONITORING EQUIPMENT MAINTENANCE AND CALIBRATION

All direct-reading instrumentation calibrations should be conducted under the approximate environmental conditions the instrument will be used. Instruments must be calibrated before and after use, noting the reading(s) and any adjustments that are necessary. All air monitoring equipment calibrations, including the standard used for calibration, must be documented on a calibration log or in the field notebook. All completed health and safety documentation/forms must be reviewed by the SSO and maintained by the FS.

All air monitoring equipment will be maintained and calibrated in accordance with the specific manufacturer's procedures. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturer's procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.

If an instrument is found to be inoperative or suspected of giving erroneous readings, the SSO must be responsible for immediately removing the instrument from service and obtaining a replacement unit. If the instrument is essential for safe operation during a specific activity, that activity must cease until an appropriate replacement unit is obtained. The SSO will be responsible for ensuring a replacement unit is obtained and/or repairs are initiated on the defective equipment.

5.4 ACTION LEVELS

Table 5.1 below presents airborne contaminant action levels that will be used to determine the procedures and protective equipment necessary based on conditions as measured at the Site.

Table 5.1 – Airborne Contaminant Action Levels

Parameter	Reading	Action
Total Hydrocarbons	0 ppm to ≤ 1 ppm	Normal operations; continue hourly breathing zone monitoring
	> 1 ppm to 5 ppm	Increase monitoring frequency to every 15 minutes and use benzene detector tube to screen for the presence of benzene
	≥ 5 ppm to ≤ 50 ppm	Upgrade to Level C PPE; continue screening for benzene
	> 50 ppm	Stop work; investigate cause of reading
	At any reading > 5 ppm	Monitor perimeter per CAMP
Benzene	≥ 1 ppm to 5 ppm	Upgrade to Level C PPE
	> 5 ppm	Stop work; investigate cause of reading

Parameter	Reading	Action
Chlorinated VOCs	≥ 1 ppm to 5 ppm	Upgrade to Level C PPE
	> 5 ppm	Stop work; investigate cause of reading
Dust	0 to .05 mg/m3	Normal operations
	0.05 to 0.1 mg/m3	Begin soil wetting procedure (Level C protection would be needed beyond this point)
	> 0.15 mg/m3	Stop work, fully implement dust control plan
Oxygen	≤ 19.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
	> 19.5% to < 23.5%	Normal operations
	≥ 23.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Carbon Monoxide	0 ppm to ≤ 20 ppm	Normal operations
	> 20 ppm	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Hydrogen Sulfide	0 ppm to ≤ 5 ppm	Normal operations
	> 5 ppm	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Flammable Vapors (LEL)	< 10% LEL	Normal operations
	≥ 10% LEL	Stop work, ventilate area, investigate source of vapors

6.0 WORK ZONES AND DECONTAMINATION

6.1 WORK ZONES

6.1.1 AUTHORIZATION TO ENTER

Only personnel with the appropriate training and medical certifications (if respirators are required) will be allowed to work at the project Site. The FS will maintain a list of authorized persons; only personnel on the authorized persons list will be allowed to enter the Site work areas.

6.1.2 SITE ORIENTATION AND HAZARD BRIEFING

No person will be allowed in the work area during Site operations without first being given a Site orientation and hazard briefing. This orientation will be presented by the FS or SSO and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards, protective equipment, safe work procedures, and emergency procedures for the project. Following this initial meeting, daily safety meetings will be held each day before work begins.

All people entering the Site work areas, including visitors, must document their attendance at this briefing, as well as the daily safety meetings on the forms included with this plan.

6.1.3 CERTIFICATION DOCUMENTS

A training and medical file may be established for the project and kept on Site during all Site operations. Specialty training, such as first aid/cardiopulmonary resuscitation (CPR) certificates, as well as current medical clearances for all project field personnel required to wear respirators, will be maintained within that file. All project personnel must provide their training and medical documentation to the SSO prior to starting work.

6.1.4 ENTRY LOG

A log-in/log-out sheet will be maintained at the Site by the FS. Personnel must sign in and out on a log sheet as they enter and leave the work area, and the FS may document entry and exit in the field notebook.

6.1.5 ENTRY REQUIREMENTS

In addition to the authorization, hazard briefing, and certification requirements listed above, no person will be allowed in any SESI work area unless they are wearing the minimum PPE as described in Section 4.0.

6.1.6 EMERGENCY ENTRANCE AND EXIT

People who must enter the work area on an emergency basis will be briefed of the hazards by the FS or SSO. All activities will cease in the event of an emergency. People exiting the work area because of an emergency will gather in a designated safe area for a head count. The FS is responsible for ensuring that all people who entered the work area have exited in the event of an emergency.

6.1.7 CONTAMINATION CONTROL ZONES

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

6.1.8 EXCLUSION ZONE (EZ)

An EZ may consist of a specific work area or may be the entire area of potential contamination. All employees entering an EZ must use the required PPE and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or a posted Site diagram will identify the location of each EZ.

6.1.9 CONTAMINATION REDUCTION ZONE

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on Site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the support zone discussed below.

6.1.10 SUPPORT ZONE (SZ)

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to Site requirements.

6.1.11 POSTING

Work areas will be prominently marked and delineated using cones, caution tape, or a posted Site diagram.

6.1.12 SITE INSPECTIONS

The FS will conduct a daily inspection of Site activities, equipment, and procedures to verify that the required elements are in place.

6.2 DECONTAMINATION

6.2.1 PERSONNEL DECONTAMINATION

All personnel wearing Modified Level D or Level C protective equipment in the EZ must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations at a minimum:

- *Station 1*: Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.
- *Station 2*: Personnel will remove their outer garment and gloves and dispose of it in properly labeled containers. Personnel will then decontaminate their hard hats, and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand carried to the next station.
- *Station 3*: Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

6.2.2 EQUIPMENT DECONTAMINATION

All vehicles that have entered the EZ will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing of tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning or pressure washing of vehicles and equipment may be required.

6.2.3 PERSONAL PROTECTIVE EQUIPMENT DECONTAMINATION

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers. Reusable protective clothing will be rinsed at the Site with detergent and water. The rinsate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift, and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water (mixed at 2% bleach by volume), or by using a spray disinfectant.

7.0 TRAINING AND MEDICAL SURVEILLANCE

7.1 TRAINING

7.1.1 GENERAL

All on-Site project personnel who work in areas where they may be exposed to Site contaminants must be trained as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER). Field employees also must receive a minimum of three (3) days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their initial training more than 12 months prior to the start of the project must have completed an eight (8)-hour refresher course within the past 12 months. The FS must have completed an additional eight (8) hours of supervisory training and must have a current first-aid/CPR certificate (See Attachment 2).

7.1.2 BASIC 40-HOUR COURSE

The following is a list of the topics typically covered in a 40-hour HAZWOPER training course:

- General safety procedures;
- Physical hazards (fall protection, noise, heat stress, cold stress);
- Names and job descriptions of key personnel responsible for site health and safety;
- Safety, health, and other hazards typically present at hazardous waste sites;
- Use, application, and limitations of PPE;
- Work practices by which employees can minimize risks from hazards;
- Safe use of engineering controls and equipment on site;
- Medical surveillance requirements;
- Recognition of symptoms and signs which might indicate overexposure to hazards;
- Worker right-to-know (Hazard Communication OSHA 1910.1200);
- Routes of exposure to contaminants;
- Engineering controls and safe work practices;
- Components of a health and safety program and a site-specific HASP;
- Decontamination practices for personnel and equipment;
- Confined-space entry procedures; and
- General emergency response procedures.

7.1.3 SUPERVISOR COURSE

Management and supervisors must receive an additional eight (8) hours of training, which typically includes:

- General Site safety and health procedures;
- PPE programs; and
- Air monitoring techniques.

7.1.4 SITE-SPECIFIC TRAINING

Site-specific training will be accomplished by on-Site personnel reading this HASP, and through a thorough site briefing by the PM, FS, or SSO on the contents of this HASP before work begins. The review must include a discussion of the chemical, physical, and biological hazards; the protective equipment and safety procedures; and emergency procedures.

7.1.5 DAILY SAFETY MEETINGS

Daily safety meetings will be held to cover the work to be accomplished, the hazards anticipated, the PPE and procedures required to minimize site hazards, and emergency procedures. The FS or SSO should present these meetings prior to beginning the day's fieldwork. No work will be performed in an EZ before a daily safety meeting has been held. An additional safety meeting must also be held prior to new tasks, or if new hazards are encountered. The daily safety meetings will be logged in the field notebook.

7.1.6 FIRST AID AND CPR

At least one (1) employee current in first aid/CPR will be assigned to the work crew and will be on the Site during operations. Site records will document the presence of this individual. Refresher training in first aid (triennially) and CPR (annually) is required to keep the certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

7.2 MEDICAL SURVEILLANCE

7.2.1 MEDICAL EXAMINATION

All personnel who are potentially exposed to Site contaminants must participate in a medical surveillance program as defined by OSHA at 29 CFR 1910.120 (f).

7.2.2 PRE-PLACEMENT MEDICAL EXAMINATION

All potentially exposed personnel must have completed a comprehensive medical examination prior to assignment, and periodically thereafter as defined by applicable regulations. The pre-placement and periodic medical examinations typically include the following elements:

- Medical and occupational history questionnaire;
- Physical examination;
- Complete blood count, with differential;

- Liver enzyme profile;
- Chest X-ray, at a frequency determined by the physician;
- Pulmonary function test;
- Audiogram;
- Electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination;
- Drug and alcohol screening, as required by job assignment;
- Visual acuity; and
- Follow-up examinations, at the discretion of the examining physician or the corporate medical director.

The examining physician provides the employee with a letter summarizing his findings and recommendations, confirming the worker's fitness for work and ability to wear a respirator. Documentation of medical clearance will be available for each employee during all project Site work.

Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician. The physical examinations must meet the requirements of 29 CFR 1910.120 and 29 CFR 1910.134. Subcontractors will supply copies of the medical examination certificate for each on-site employee.

7.2.3 OTHER MEDICAL EXAMINATIONS

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- At employee request after known or suspected exposure to toxic or hazardous materials; and
- At the discretion of the SSO, HSM, or occupational physician in anticipation of, or after known or suspected exposure to toxic or hazardous materials.

7.2.4 PERIODIC EXAM

Following the placement examination, all employees must undergo a periodic examination, similar in scope to the placement examination. For employees potentially exposed over 30 days per year, the frequency of periodic examinations will be annual. For employees potentially exposed less than 30 days per year, the frequency for periodic examinations will be 24 months.

7.2.5 MEDICAL RESTRICTION

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the SSO. The terms of the restriction will be discussed with the employee and the supervisor.

8.0 GENERAL SAFETY PRACTICES

8.1 GENERAL SAFETY RULES

General safety rules for site activities include, but are not limited to, the following:

- At least one copy of this HASP must be in a location at the Site that is readily available to personnel, and all project personnel shall review the plan prior to starting work.
- Consume or use food, beverages, chewing gum, and tobacco products only in the SZ or other designated area outside the EZ and CRZ. Cosmetics shall not be applied in the EZ or CRZ.
- Wash hands before eating, drinking, smoking, or using toilet facilities.
- Wear all PPE as required and stop work and replace damaged PPE immediately.
- Secure disposable coveralls, boots, and gloves at the wrists and legs and ensure closure of the suit around the neck.
- Upon skin contact with materials that may be impacted by COCs, remove contaminated clothing and wash the affected area immediately. Contaminated clothing must be changed. Any skin contact with materials potentially impacted by COCs must be reported to the FS or SSO immediately. If needed, medical attention should be sought.
- Practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COCs, such as standing water, mud, or discolored soil. Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination.
- Remove PPE as required in the CRZ to limit the spread of COC-containing materials.
- At the end of each shift or as required, dispose of all single-use coveralls, soiled gloves, and respirator cartridges in designated receptacles designated for this purpose.
- Removing soil containing Site COCs from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air is prohibited.
- Inspect all non-disposable PPE for contamination in the CRZ. Any PPE found to be contaminated must be decontaminated or disposed of appropriately.
- Recognize emergency signals used for evacuation, injury, fire, etc.
- Report all injuries, illnesses, and unsafe conditions or work practices to the FS or SSO.
- Use the “buddy system” during all operations requiring Level C PPE, and when appropriate, during Modified Level D operations.
- Obey all warning signs, tags, and barriers. Do not remove any warnings unless authorized to do so.
- Use, adjust, alter, and repair equipment only if trained and authorized to do so, and in accordance with the manufacturer’s directions.
- Personnel are to perform only tasks for which they have been properly trained and will advise their supervisor if they have been assigned a task for which they are not trained.
- The presence or consumption of alcoholic beverages or illicit drugs during the workday, including breaks, is strictly prohibited. Notify your supervisor if you must take prescription or over-the-counter drugs that indicate they may cause drowsiness or, that you should not operate heavy equipment.
- Remain upwind during site activities whenever possible.

8.2 BUDDY SYSTEM

On-Site personnel must use the buddy system as required by operations. Use of the "buddy system" is required during all operations requiring Level C to Level A PPE, and when appropriate, during Level D operations. Crewmembers must observe each other for signs of chemical exposure, and heat or cold stress. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin coloration;
- Changes in coordination;
- Changes in demeanor;
- Excessive salivation and pupillary response; and
- Changes in speech pattern.

Crewmembers must also be aware of the potential exposure to possible safety hazards, unsafe acts, or non-compliance with safety procedures.

Field personnel must inform their partners or fellow crewmembers of non-visible effects of exposure to toxic materials that they may be experiencing. The symptoms of such exposure may include, but are not limited to:

- Headaches;
- Dizziness;
- Nausea;
- Blurred vision;
- Cramps; and
- Irritation of eyes, skin, or respiratory tract.

If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

8.3 HEAT STRESS

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Heat rashes are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much or too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for six (6) to eight (8) hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; headache, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

8.4 HEAT STRESS SAFETY PRECAUTIONS

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described in **Table 8.1** below.

Table 8.1 – Work/Rest Schedule

Adjusted Temperature[b]	Work/Rest Regimen Normal Work Ensemble[c]	Work/Rest Regimen Impermeable Ensemble
90ºF (32.2ºC) or above	After each 45 minutes of work	After each 15 minutes of work
87.5º - 90ºF (30.8º-32.2ºC)	After each 60 minutes of work	After each 30 minutes of work
82.5º - 87.5ºF (28.1º - 30.8ºC)	After each 90 minutes of work	After each 60 minutes of work
77.5º - 82.5ºF (25.3º - 28.1ºC)	After each 120 minutes of work	After each 90 minutes of work
72.5º - 77.5ºF (30.8º - 32.2ºC)	After each 150 minutes of work	After each 120 minutes of work

a. For work levels of 250 kilocalories/hour (Light-Moderate Type of Work)

b. Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

c. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

d. The information presented above was generated using the information provided in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) Handbook.

In order to determine if the work rest cycles are adequate for the personnel and specific Site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any Site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- On-Site drinking water will be kept cool (50 to 60°F).
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Employees must not be assigned to other tasks during breaks.
- Employees must remove impermeable garments during rest periods. This includes white Tyvek-type garments.

All employees must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

8.5 COLD STRESS

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances, in temperatures of 40°F. Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Areas of the body that have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two (2) factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F. An equivalent chill temperature chart relating the actual dry bulb temperature and wind velocity is presented in **Table 8.2** below.

Table 8.2– Wind Chill Temperature Chart

Estimated Wind Speed (in mph)	**Actual Temperature Reading (ºF)**											
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (ºF)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	**LITTLE DANGER** **Maximum danger of false sense of security.**				**INCREASING DANGER** **Danger from freezing of exposed flesh within one minute.**			**GREAT DANGER** **Flesh may freeze within 30 seconds.**				
	Trench foot and immersion foot may occur at any point on this chart.											

[This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA (Source: ACGIH Threshold Limit Values for Chemical Substances and Physical Agents)].

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of tissue damage associated with frostbite. Frostbite of the extremities can be categorized into:

- *Frost Nip or Incipient Frostbite* - characterized by sudden blanching or whitening of skin.
- *Superficial Frostbite* - skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- *Deep Frostbite* - tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages: 1) shivering; 2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and 5) death. Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be utilized to prevent cold stress.

8.6 SAFETY PRECAUTIONS FOR COLD STRESS PREVENTION

For air temperature of 0°F or less, mittens should be used to protect the hands. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.

At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.

If work is done at normal temperature or in a hot environment before entering the cold, the field personnel must ensure that their clothing is not wet as a consequence of sweating. Wet field personnel must change into dry clothes prior to entering the cold area.

If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.

Field personnel handling evaporative liquid (e.g., gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

8.7 SAFE WORK PROCEDURES

Direct contact between bare skin and cold surfaces (< 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.

For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.

Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing. Work should be arranged in such a way that sitting or standing still for long periods is minimized.

During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

8.8 BIOLOGICAL HAZARDS

Biological hazards may include poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, spiders, and other pests.

8.8.1 TICK BORNE DISEASES

Lyme Disease - The disease commonly occurs in summer and is transmitted by the bite of infected ticks. “Hot spots” in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

Erlichiosis - The disease also commonly occurs in summer and is transmitted by the bite of infected ticks. “Hot spots” in the United States include New York, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, and swelling and pain in the joints, and eventually, arthritis. Symptoms of erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

Rocky Mountain Spotted Fever (RMSF) - This disease is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (Rickettsia rickettsii) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for two to three weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

Control - Tick repellant containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

8.8.2 POISONOUS PLANTS

Poisonous plants may be present in the work area. Personnel should be alerted to its presence and instructed on methods to prevent exposure.

Control - The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water and observed for signs of reddening.

8.8.3 SNAKES

The possibility of encountering snakes exists, specifically for personnel working in wooded/vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snakebites include swelling, edema, and pain around the bite, and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control - To minimize the threat of snakebites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes, and the need to avoid actions potentiating encounters, such as turning over logs, etc. If a snakebite occurs, an attempt should be made to safely identify the snake via size and markings. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band and washing the area around the wound to remove any unabsorbed venom.

8.8.4 SPIDERS

Personnel may encounter spiders during work activities.

Two spiders are of concern: the black widow and the brown recluse. Both prefer dark sheltered areas such as basements, equipment sheds and enclosures, and around woodpiles or other scattered debris. The black widow is shiny black, approximately one inch long, and has a distinctive red hourglass marking on the underside of its body. The black widow is found throughout the United States. The bite of a black widow is seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting, and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. It has a distinctive violin shape on the top of its body. The brown recluse is more prevalent in the southern

United States. The bite of the brown recluse is painful and the bite site ulcerates and takes many weeks to heal completely.

Control - To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs, and placing hands in dark places such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

8.9 NOISE

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site.

Control - All personnel must wear hearing protection, with a Noise Reduction Rating (NRR) of at least 20, when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss. Noise monitoring is discussed in Section 5.2, Noise Monitoring.
Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

All personnel must take every precaution to minimize the potential for spills during site operations. All on-Site personnel shall immediately report any discharge, no matter how small, to the FS.

Spill control equipment and materials will be located on the Site at locations that present the potential for discharge. All sorbent materials used for the cleanup of spills will be containerized and labeled appropriately. In the event of a spill, the FS will follow the provisions in Section 10.0, Emergency Procedures, to contain and control released materials and to prevent their spread to off-Site areas.

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8.11 SANITATION

Site sanitation will be maintained according to OSHA requirements.

8.11.1 BREAK AREA

Breaks must be taken in the SZ, away from the active work area after Site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in any area other than the SZ.

8.11.2 POTABLE WATER

The following rules apply to all field operations:

- An adequate supply of potable water will be provided at each project site. Potable water must be kept away from hazardous materials or media, and contaminated clothing or equipment.
- Portable containers used to dispense drinking water must be capable of being tightly closed and must be equipped with a tap dispenser. Water must not be consumed directly from the container (drinking from the tap is prohibited) nor may it be removed from the container by dipping.
- Containers used for drinking water must be clearly marked and shall not be used for any other purpose.
- Disposable drinking cups must be provided. A sanitary container for dispensing cups and a receptacle for disposing of used cups is required.

8.11.3 SANITARY FACILITIES

Access to facilities for washing before eating, drinking, or smoking, or alternate methods such as waterless hand-cleaner and paper towels will be provided.

8.11.4 LAVATORY

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided. This requirement does not apply to mobile crews or to normally unattended Site locations so long as employees at these locations have transportation immediately available to nearby toilet facilities.

8.12 EMERGENCY EQUIPMENT

Adequate emergency equipment for the activities being conducted on site and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926 will be on Site prior to the commencement of project activities. Personnel will be provided with access to emergency equipment, including, but not limited to, the following:

- Fire extinguishers of adequate size, class, number, and location as required by applicable sections of 29 CFR 1910 and 1926;
- Industrial first aid kits of adequate size for the number of personnel on site; and
- Emergency eyewash and/or shower if required by operations being conducted on Site.

8.13 LOCKOUT/TAGOUT PROCEDURES

Only fully qualified and trained personnel will perform maintenance procedures. Before maintenance begins, lockout/tagout procedures per OSHA 29 CFR 1910.147 will be followed.

Lockout is the placement of a device that uses a positive means, such as lock, to hold an energy or material-isolating device such that the equipment cannot be operated until the lockout device is removed. If a device cannot be locked out, a tagout system shall be used. Tagout is the placement of a warning tag on an energy or material isolating device indicating that the equipment controls may not be operated until the personnel who attached the tag remove the tag.

8.14 ELECTRICAL SAFETY

Electricity may pose a particular hazard to Site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

General electrical safety requirements include:

- All electrical wiring and equipment must be a type listed by Underwriters Laboratories (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.
- All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or USCG regulations.
- Portable and semi-portable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools must be distinctly marked and listed by UL or FM.
- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.
- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- All circuits must be protected from overload.
- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.
- Plugs and receptacles must be kept out of water unless of an approved submersible construction.
- All extension cord outlets must be equipped with ground fault circuit interrupters (GFCI).
- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.
- Extension cords or cables must be inspected prior to each use and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.
- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

8.15 LIFTING SAFETY

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.
- The hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.
- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.

- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.

8.16 LADDER SAFETY

When portable ladders are used for access to an upper landing surface, the ladder side rails shall extend at least three (3) feet (9 m) above the upper landing surface to which the ladder is used to gain access; or, when such an extension is not possible because of the ladder's length, then the ladder shall be secured at its top to a rigid support that will not deflect, and a grasping device, such as a grabrail, shall be provided to assist employees in mounting and dismounting the ladder. In no case shall the extension be such that ladder deflection under a load would, by itself, cause the ladder to slip off its support.

- Ladders shall be maintained free of oil, grease, and other slipping hazards.
- Ladders shall not be loaded beyond the maximum intended load for which they were built, or beyond their manufacturer's rated capacity.
- Ladders shall be used only for the purpose for which they were designed.
- Non-self-supporting ladders shall be used at an angle such that the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder (the distance along the ladder between the foot and the top support).
- Wood job-made ladders with spliced side rails shall be used at an angle such that the horizontal distance is one-eighth the working length of the ladder.
- Fixed ladders shall be used at a pitch no greater than 90 degrees from the horizontal, as measured to the back side of the ladder.
- Ladders shall be used only on stable and level surfaces unless secured to prevent accidental displacement.
- Ladders shall not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental displacement. Slip-resistant feet shall not be used as a substitute for care in placing, lashing, or holding a ladder that is used upon slippery surfaces, including, but not limited to, flat metal or concrete surfaces that are constructed so they cannot be prevented from becoming slippery.
- Ladders placed in any location where they can be displaced by workplace activities or traffic, such as in passageways, doorways, or driveways, shall be secured to prevent accidental displacement, or a barricade shall be used to keep the activities or traffic away from the ladder.
- The area around the top and bottom of ladders shall be kept clear.
- The top of a non-self-supporting ladder shall be placed with the two rails supported equally unless it is equipped with a single support attachment.
- Ladders shall not be moved, shifted, or extended while occupied.
- Ladders shall have non-conductive side rails if they are used where the employee or the ladder could contact exposed energized electrical equipment.
- The top, top step, or the step labeled that it or any step above it should not be used as a step.

- Cross-bracing on the rear section of stepladders shall not be used for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.
- Ladders shall be inspected by the HSM for visible defects on a daily basis and after any occurrence that could affect their safe use.
- Portable ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps; broken or split rails; corroded components; or other faulty or defective components shall either be immediately marked in a manner that readily identifies them as defective or be tagged with “Do Not Use” or similar language and shall be withdrawn from service.
- Fixed ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps; broken or split rails; or corroded components; shall be withdrawn from service.
- Ladder repairs shall restore the ladder to a condition meeting its original design criteria, before the ladder is returned to use.
- Single-rail ladders shall not be used.
- When ascending or descending a ladder, the user shall face the ladder.
- Each employee shall use at least one hand to grasp the ladder when progressing up and/or down the ladder.
- An employee shall not carry any object or load that could cause the employee to lose balance and fall.

8.17 TRAFFICE SAFETY

The project Site may be located adjacent to a public roadway where exposure to vehicular traffic is likely. Traffic may also be encountered as vehicles enter and exit the area. To minimize the likelihood of project personnel and activities being affected by traffic, the following procedures will be implemented.

Cones must be placed along the shoulder of the roadway starting 100 feet from the work area to alert passing motorists to the presence of personnel and equipment. A “Slow” or “Men Working” sign must be placed at the first cone. Barricades with flashing lights should be placed between the roadway and the work area.

During activities along a roadway, equipment will be aligned parallel to the roadway to the extent feasible, facing into the oncoming traffic so as to place a barrier between the work crew and the oncoming traffic. All crewmembers must remain behind the equipment and the traffic barrier.

All Site personnel who are potentially exposed to vehicular traffic must wear an outer layer of orange warning garments, such as vests, jackets, or shirts. If work is performed in hours of dusk or darkness, workers will be outfitted with reflective garments either orange, white (including silver-coated reflective coatings or elements that reflect white light), yellow, fluorescent red-orange, or fluorescent yellow-orange.

The flow of traffic into and out of the adjacent business must be assessed, and precautions taken to warn motorists of the presence of workers and equipment. Where possible, vehicles should be aligned to provide physical protection of people and equipment.

9.0 SITE-SPECIFIC HAZARDS AND CONTROL MEASURES

9.1 EVALUATION OF HAZARDS

The evaluation of hazards is provided as a quick reference as to the known conditions for the Site, wherein the level of detail for each of the subsections is identified.

9.1.1 HAZARD CHARACTERISTICS

Existing information for Site:

__X__ Detailed _____ Preliminary _____ None

Hazardous/Contaminated Material Form(s):

__X__ Solid __X__Liquid __X__Sludge ___Gas __X__Vapor

Containment Type(s):

__X__ Drum _____ Tank _____ Pit _____ Debris

_____ Pond _____Lagoon Other: None known

Hazardous Material Characteristics:

__X__ Volatile _____ Corrosive _____ Reactive _____ Radioactive

__X__ Ignitable __X__ Toxic __X__ Unknown

Routes of Exposure:

__X__ Oral __X__ Dermal __X__ Eye __X__ Respiratory

9.1.2 POTENTIAL HEALTH AND SAFETY HAZARDS

__X__ Heat

__X__ Cold

_____ Confined space entry

_____ Oxygen depletion

_____ Asphyxiation

_____ Excavation

_____ Cave-ins

__X__ Falls, slippage

__X__ Heavy equipment

_____ Other: Potential Ignition Hazard

_____ Non-ionizing Radiation (i.e. UV, IR, etc.)

__X__Congested areas

__X__ General Construction

__X__ Physical injury

__X__ Electrical hazards

__X__ Handling and product transfer

__X__ Fire

__X__ Explosion

__X__ Biological Hazards

_____Plants – Poison Ivy, Poison Oak

_X_ Insects – Ticks

_X_ Insects – Mosquitoes
_X_ Insects – Bees and Wasps
_X_ Rats and Mice

9.2 FIELD ACTIVITIES, HAZARDS AND CONTROL PROCEDURES

The following task-specific safety analyses identify potential health, safety, and environmental hazards associated with each type of field activity. Because of the complex and changing nature of field projects, supervisors must continually inspect the Site to identify hazards that may affect on-Site personnel, the community, or the environment. The FS must be aware of these changing conditions and discuss them with the PM whenever these changes impact employee health, safety, the environment, or performance of the project. The FS will keep on-Site personnel informed of the changing conditions, and the PM will write and/or approve addenda or revisions to this HASP as necessary.

9.2.1 MOBILIZATION/CONSTRUCTION STAKEOUT

<u>Description of Tasks</u>

Site mobilization will include establishing sampling locations, determining the location of utilities and other installations, and establishing work areas on the Site. A break area will be set up outside of regulated work areas. Mobilization may involve clearing areas for the SZ and CRZ. During this initial phase, project personnel will walk the Site to confirm the existence of anticipated hazards and identify safety and health issues that may have arisen since the writing of this plan.

<u>Hazard Identification</u>

The hazards of this phase of activity are associated with heavy equipment operation, manual materials handling, installation of temporary on-site facilities, and manual site preparation.

Manual materials handling and manual site preparation may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion, and laceration hazards. Installation of temporary field office and support facilities may expose personnel to electrical hazards, underground and overhead utilities, and physical injury due to the manual lifting and moving of materials. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat- or cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

Controls

Control procedures for these hazards are discussed in Section 8.0, General Safety Practices.

9.2.2 DEMOLITION/SITE-CLEARING

Description of Tasks

Site clearance will involve manual or mechanical removal of objects impeding access to the construction footprint. These obstructions are both natural and man-made items and will include, but not be limited to, fabricated metal and concrete structures, trees, vegetation, rubble, and miscellaneous trash/debris.

Hazard Identification

Hazards associated with demolition and site clearance include personnel working in and around potentially unstable structures, or locations of potential contact with hazardous chemicals, utilities, and/or falling objects. This task will involve manual, as well as mechanical demolition/clearance efforts so exertion and equipment hazards exist.

Controls

PPE – Personnel shall be protected from hazards of irritant and toxic plants and suitably instructed in the first aid treatment available.

Preparatory Operations – Prior to permitting employees to start demolition operations, an engineering survey shall be made, by a licensed Professional Engineer, of the structure to determine the stability of the structure. Any adjacent structure shall where personnel may be exposed shall also be similarly checked. The PO shall have in writing evidence that such a survey has been performed. All structural instabilities shall be shored or braced, under the supervision of a licensed Professional Engineer, prior to access by an FP.

Utilities – All electric, gas, water, steam, sewer, and other service lines shall be shut off, caped, or otherwise controlled, outside the building line before demolition work is started. In each case, any utility company that is involved shall be notified in advance. If it is necessary to maintain any power, water or other utilities during demolition, such lines shall be temporarily relocated, as necessary.

Hazardous Substances – It shall also be determined if any type of hazardous chemicals, gases, explosives, flammable materials, or similarly dangerous substances have been used in any pipes, tanks, or other equipment on the property. When the presence of any such substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

Falling Debris/Objects – No material shall be dropped to any point lying outside the exterior walls of the structure unless the area is effective protected. Access to the area where falling objects/debris may be encountered must be gated and controlled.

Structural Collapse – Structural or load supporting members on any floor shall not be cut or removed until all stories above such a floor have been demolished and removed. Walls, which are to serve as retaining walls against which debris will be piled, shall not be so used unless capable of safely supporting the imposed load. Mechanical equipment shall not be used on floors or working surfaces unless such floors or surfaces are not of sufficient strength to support the imposed load.

Rollover Guards – All equipment used in site clearing operations shall be equipped with rollover guards meeting the applicable requirements. In addition, rider-operated equipment shall be equipped with an overhead and rear canopy guard meeting the applicable requirements.

Inspections – During demolition, continuing inspections by a licensed Professional Engineer shall be made as the work progresses to detect hazards resulting from weakened or deteriorated floors, walls, or loosened material. No FP shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other effective means.

Traffic – Control measures for traffic are addressed in Section 8.17.

9.2.2.1 DISTURBANCE/HANDLING OF CONTAMINATED MATERIAL

Description of Tasks

After the contaminated soil is excavated from below the Site's surface, the material will be stockpiled, dried, and either transported off Site or relocated and backfilled on Site.

Hazard Identification

The hazards associated with materials handling include contact of the contaminated material with project personnel, or cross contamination with other site soil.

Controls

Cross Contamination – Following excavation, contaminated soil stockpiles will be placed on a structure constructed to separate the material from the site soil and collect any groundwater leachate. The material shall be covered to prevent storm water erosion or migration of contaminants through storm water.

Air Monitoring – Air and particulate monitoring will be conducted during soil excavation activities to assess the potential for exposure to airborne COCs. If the results of air monitoring indicate the presence of organic vapors or particulates in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 5.1, Air Monitoring, for a description of air monitoring requirements and action levels. Air monitoring protocols are also presented in the Community Air Monitoring Plan (Appendix F of this RIWP). A description of each level of personal protection is included in Section 4.0, Personal Protective Equipment.

Traffic – Control measures for traffic are addressed in Section 8.17.

9.2.3 DRILLING/SUBSURFACE INTRUSION ACTIVITIES

Description of Tasks

Site mobilization will include establishing excavation locations, determining the location of utilities and other installations, and establishing work areas. Mobilization will also include setting up equipment and establishing a temporary Site office. A break area will be set up outside of regulated work areas. Mobilization may involve clearing areas for the SZ and CRZ. During this initial phase, project personnel will walk the Site to confirm the existence of anticipated hazards and identify safety and health issues that may have arisen since the writing of this plan.

Hazard Identification

The primary physical hazards for this activity are associated with the use of soil boring and grouting equipment. The equipment is hydraulically powered and uses static force and dynamic percussion force to advance sampling and penetrating tubes.

Accidents can occur as a result of improperly placing the equipment on uneven or unstable terrain or failing to adequately secure the equipment prior to the start of operations. Overhead utility lines can create hazardous conditions if contacted by the equipment. Underground installations such as electrical lines, conduit, and product lines pose a significant hazard if contacted.

Controls

Geoprobe and Drill Rig Safety Procedures - The operator of the equipment must possess required state or local licenses to perform such work. All members of the crew shall receive Site-specific training prior to beginning work.

The operator is responsible for the safe operation of the rig, as well as the crew's adherence to the requirements of this HASP. The operator must ensure that all safety equipment is in proper condition and is properly used. The members of the crew must follow all instructions of the operator, wear all personal protective equipment, and be aware of all hazards and control procedures. The operator and crew must participate in the Daily Safety Meetings and be aware of all emergency procedures.

Equipment Inspection - Each day, prior to the start of work, the rig and associated equipment must be inspected by the operator. The following items must be inspected:

- Vehicle condition;
- Proper storage of equipment;

- Condition of all hydraulic lines;
- Fire extinguisher; and
- First aid kit.

Equipment Set Up - The drill rig must be properly blocked and leveled prior to raising the derrick. The wheels which remain on the ground must be chocked. The leveling jacks shall not be raised until the derrick is lowered. The rig shall be moved only after the derrick has been lowered.

All well sites will be inspected by the driller prior to the location of the rig to verify a stable surface exists. This is especially important in areas where soft, unstable terrain is common.

The drill rig must be properly blocked and leveled prior to raising the derrick. Blocking provides a more stable drilling structure by evenly distributing the weight of the rig. Proper blocking ensures that differential settling of the rig does not occur.

When the ground surface is soft or otherwise unstable, wooden blocks, at least 24" by 24" and 4" to 8" thick shall be placed between the jack swivels and the ground. The emergency brake shall be engaged, and the wheels that are on the ground shall be chocked.

Rules for Intrusive Activity - Before beginning any intrusive activity, the existence and location of underground pipe, conduit, electrical equipment, and other installations will be determined. This will be done, if possible, by contacting the appropriate client representative to mark the location of the lines. “Call Before You Dig” will verify the potential for encountering subsurface utilities. If the client’s knowledge of the area is incomplete, an appropriate device, such as a magnetometer, will be used to locate the line.

Combustible gas readings of the general work area will be made regularly in areas where and/or during operations when the presence of flammable vapors or gases is suspected, such as during intrusive activities (see Section 5.1). Operations must be suspended and corrective action taken if the airborne flammable concentration reaches 10% of the LEL in the immediate area (a one-foot radius) of the point of drilling, or near any other ignition sources.

Overhead Electrical Clearances - If equipment is operated in the vicinity of overhead power lines, the power to the lines must be shut off or the equipment must be positioned and blocked such that no part, including cables, can come within the minimum clearances as follows:

Nominal System Voltage	Minimum Required Clearance
0-50kV	10 feet
51-100kV	12 feet
101-200kV	15 feet
201-300kV	20 feet
301-500kV	25 feet
501-750kV	35 feet
751-1,000kV	45 feet

When the drill rig is in transit, with the boom lowered and no load, the equipment clearance must be at least four (4) feet for voltages less than 50kV, 10 feet for voltages of 50 kV to 345 kV, and 16 feet for voltages above 345 kV.

Hoisting Operations - Drillers should never engage the rotary clutch without watching the rotary table, and ensuring it is clear of personnel and equipment.

Unless the drawworks is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.

Drill pipe, auger strings or casing should be picked up slowly. Drill pipe should not be hoisted until the driller is sure that the pipe is latched in the elevator, or the derrickman has signaled that he may safely hoist the pipe.

During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor; no one else should be on the rig or derrick.

The brakes on the drawworks of the drill rig should be tested by the driller each day. The brakes should be thoroughly inspected by a competent individual each week.

A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.

Workers should never stand near the borehole whenever any wire line device is being run.

Hoisting control stations should be kept clean and controls labeled as to their functions.

Catline Operations - Only experienced workers will be allowed to operate the cathead controls. The kill switch must be clearly labeled and operational prior to operation of the catline. The cathead area must be kept free of obstructions and entanglements.
The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

Personnel should not stand near, step over, or go under a cable or catline which is under tension.

Employees rigging loads on catlines shall:

- Keep out from under the load;
- Keep fingers and feet where they will not be crushed;
- Be sure to signal clearly when the load is being picked;
- Use standard visual signals only and not depend on shouting to coworkers; and
- Make sure the load is properly rigged, since a sudden jerk in the catline will shift or drop the load.

Wire Rope - When two wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope shall be removed from service or re-socketed. Special attention shall be given to the inspection of end fittings on boom support, pendants, and guy ropes.

Wire rope removed from service due to defects shall be cut up or plainly marked as being unfit for further use as rigging.

Wire rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope; the clip nuts shall be re-tightened immediately after initial load carrying use and at frequent intervals thereafter.

When a wedge socket fastening is used, the dead or short end of the wire rope shall have a clip attached to it or looped back and secured to itself by a clip; the clip shall not be attached directly to the live end.

Protruding ends of strands in splices on slings and bridles shall be covered or blunted.

Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads, shall consist of one continuous piece without knot or splice.

An eye splice made in any wire rope shall have not less that five full tucks.

Wire rope shall not be secured by knots. Wire rope clips shall not be used to splice rope.

Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire clips or knots.

Pipe/Auger Handling - Pipe and auger sections shall be transported by cart or carried by two persons. Individuals should not carry auger or pipe sections without assistance.

Workers should not be permitted on top of the load during loading, unloading, or transferring of pipe or rolling stock.

Employees should be instructed never to try to stop rolling pipe or casing; they should be instructed to stand clear of rolling pipe.

Slip handles should be used to lift and move slips. Employees are not permitted to kick slips into position.

When pipe is being hoisted, personnel should not stand where the bottom end of the pipe could whip and strike them.

Pipe and augers stored in racks, catwalks or on flatbed trucks should be secured to prevent rolling.

9.2.4 SUBSURFACE CHEMICAL SAMPLE/COLLECTION ANALYSIS

Description of Tasks

This sub-task consists of the collection of soil samples for subsequent field and laboratory analysis. The physical hazards of soil sampling are primarily associated with the sample collection methods, procedures utilized, and the environment itself.

Hazard Identification

Incidental contact with COCs is the primary hazard associated with sampling the stabilized material. This contact may occur through the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. The primary hazards associated with these sampling procedures are not potentially serious; however, other operations in the area, or the conditions under which samples must be collected, may present chemical and physical hazards. The hazards directly associated with sampling procedures are generally limited to strains/sprains and potential eye hazards. Potential chemical hazards may include contact with media containing Site COCs and potential contact with chemicals used for equipment decontamination.

Controls

PPE – To control dermal exposure during sampling activities, a minimum of Level D protection will be worn. If necessary, based on field observations and site conditions, air monitoring may be conducted during sediment sampling activities. If the results of air monitoring indicate the presence of airborne contaminants in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 5.1, Air Monitoring, for a description of air monitoring requirements and action levels. Air monitoring protocols are also presented in the Community Air Monitoring Plan (Appendix F of this RIWP). A description of each level of personal protection is included in Section 4.0, Personal Protective Equipment.

9.2.5 DECONTAMINATION

All equipment will be decontaminated before leaving the Site. Personnel involved in decontamination activities may be inadvertently exposed to skin contact with contaminated materials and chemicals brought from the EZ. Personnel involved in decontamination activities must wear PPE that is, at a minimum, one level below the level worn by personnel working in the EZ.

9.2.6 DEMOBILIZATION

Demobilization involves the removal of all tools, equipment, supplies, and vehicles brought to the site. The hazards of this phase of activity are associated with heavy equipment operation and manual materials handling.

Manual materials handling may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion, and laceration hazards. Heavy equipment operation presents noise and vibration hazards, and hot surfaces, to operators. Personnel in the vicinity of heavy equipment operation may be exposed to physical hazards resulting in fractures, contusions, and lacerations and may be exposed to high noise levels. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat-or cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

Control procedures for these hazards are discussed in Section 8.0, General Safety Practices.

9.3 CHEMICAL HAZARDS

The chemical hazards associated with Site operations are related to inhalation, ingestion, and skin exposure to Site COCs. Concentrations of airborne COCs during Site tasks may be measurable and will require air monitoring during certain operations. Air monitoring requirements for Site tasks are outlined in Section 5.1. Air monitoring protocols are also presented in the Community Air Monitoring Plan (Appendix of the RIWP).

COCs at the Site include VOCs, SVOCs, pesticides, metals and PFAS.

The potential for inhalation of site COCs is moderate. The potential for dermal contact with soils containing Site COCs during remedial operations is moderate. **Table 9.1** lists the primary contaminants that have been identified at the Site and the media in which they are present.

Table 9.1 – List of Primary Contaminants

Media: Soil		
Volatiles (VOCs)	**Maximum Concentration (mg/kg)**	**Applicable Monitoring Instrument**
Cis-1,2-Dichloroethene (DCE)	600	PID
Tetrachloroethene (PCE)	39,000	PID
Trichloroethene (TCE)	720	PID
Vinyl Chloride	0.56	PID
Ethylbenzene	1.4	PID
1,2,4-Trimethylbenzene	12	PID
Xylenes	1.3	PID
Acetone	0.068	PID
Semi-Volatiles (SVOCs)	**Maximum Concentration (mg/kg)**	**Applicable Monitoring Instrument**
Benzo(b)fluoranthene	1.1	PID
Indeno(1,2,3-cd)pyrene	0.56	PID
Pesticides	**Maximum Concentration (mg/kg)**	**Applicable Monitoring Instrument**
4,4'-DDD	3.98	Not Applicable
Metals	**Maximum Concentration (mg/kg)**	**Applicable Monitoring Instrument**
Cadmium	6.28	Not Applicable
Copper	94	Not Applicable
Lead	1380	Not Applicable
Mercury	4.78	Not Applicable
Nickel	56.6	Not Applicable
Zinc	788	Not Applicable

Media: Groundwater		
Volatiles (VOCs)	**Maximum Concentration (ug/L)**	**Applicable Monitoring Instrument**
Cis-1,2-Dichloroethene (DCE)	57,000	PID
Tetrachloroethene (PCE)	340,000	PID
Trichloroethene (TCE)	36,000	PID

Media: Groundwater		
Vinyl Chloride	1100	PID
Benzene	3.2	PID
Chloroform	51	PID
trans-1,2-Dichloroethene	150	PID
n-Butylbenzene	5.6	PID
sec-Butylbenzene	6.9	PID
Isopropylbenzene	10	PID
Naphthalene	580	PID
n-Propylbenzene	12	PID
1,2,4-Trimethylbenzene	160	PID
1,2,4,5-Tetramethylbenzene	27	PID
Semi-Volatiles (SVOCs)	**Maximum Concentration (ug/L)**	**Applicable Monitoring Instrument**
1,4-Dichlorobenzene	3.6	PID
Bis(2-ethylhexyl)phthalate	33	PID
Phenol	6.6	PID
Acenaphthene	22	PID
Naphthalene	423	PID
Benzo(a)anthracene	0.09	PID
Benzo(b)fluoranthene	0.03	PID
Chrysene	0.18	PID
Phenanthrene	63	PID
PFAS	**Maximum Concentration (ug/L)**	**Applicable Monitoring Instrument**
PFOA, PFOS	0.0821	Not Applicable
Metals	**Maximum Concentration (ug/L)**	**Applicable Monitoring Instrument**
Chromium	58.9	Not Applicable
Iron	639,000	Not Applicable
Lead	277	Not Applicable
Manganese	5,909	Not Applicable
Sodium	867,000	Not Applicable
Thallium	1.17	Not Applicable

Media: Soil Vapor		
Volatiles (VOCs)	**Maximum Concentration (ug/m^3)**	**Applicable Monitoring Instrument**
Cis-1,2-Dichloroethene (DCE)	2,300,000	PID
Tetrachloroethene (PCE)	110,000,000	PID
Trichloroethene (TCE)	1,200,000	PID
Vinyl Chloride	39,000	PID
1,1-Dichloroethene	20,000	PID
Methylene Chloride	170,000	PID
n-Hexane	180,000	PID
cis-1,2-Dichloroethene	2,300,000	PID
1,1,1-Trichloroethane	110,000	PID
Cyclohexane	69000	PID
Carbon Tetrachloride	22,000	PID
2,2,4-Trimethylpentane	93,000	PID
Benzene	64,000	PID
n-Heptane	82,000	PID
Toluene	75,000	PID
Ethylbenzene	87,000	PID
m,p-Xylene	220,000	PID
o-Xylene	87,000	PID
1,3,5-Trimethylbenzene	98,000	PID
1,2,4-Trimethylbenzene	98,000	PID
Naphthalene	260,000	PID

10.0 EMERGENCY PROCEDURES

10.1 GENERAL

Prior to the start of operations, the work area will be evaluated for the potential for fire, contaminant release, or other catastrophic event. Unusual conditions or events, activities, chemicals, and conditions will be reported to the FS/SSO immediately.

The FS/SSO will establish evacuation routes and assembly areas for the Site. All personnel entering the Site will be informed of this route and the assembly area.

10.2 EMERGENCY RESPONSE

If an incident occurs, the following steps will be taken:

- The FS/SSO will evaluate the incident and assess the need for assistance and/or evacuation;
- The FS/SSO will call for outside assistance as needed;
- The FS/SSO will ensure the PM is notified promptly of the incident;
- The FS/SSO will take appropriate measures to stabilize the incident scene; and
- The PM will notify the NYSDEC Project Manager.

10.2.1 FIRE

In the case of a fire at the Site, the FS/SSO will assess the situation and direct fire-fighting activities. The FS/SSO will ensure that the PM is immediately notified of any fires. Site personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. In the event of a fire that Site personnel are unable to safely extinguish with one (1) fire extinguisher, the local fire department will be summoned.

10.2.2 CONTAMINANT RELEASE

In the event of a contaminant release, the following steps will be taken:

- Notify FS/SSO immediately;
- Evacuate immediate area of release;
- Conduct air monitoring to determine needed level of PPE;
- Don required level of PPE and prepare to implement control procedures; and
- After control procedures are implemented the FS/SSO will inform the project PM who will then inform NYSDEC PM

The FS/SSO has the authority to commit resources as needed to contain and control released material and to prevent its spread to off-Site areas.

10.3 MEDICAL EMERGENCY

All employee injuries must be promptly reported to the SSO/FS, who will:

- Ensure that the injured employee receives prompt first aid and medical attention;
- In emergency situations, the worker is to be transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room); and
- If the injured person is a SESI employee, notify SESI at 973-808-9050.

10.3.1 EMERGENCY CARE STEPS

Survey the scene. Determine if it is safe to proceed. Try to determine if the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.

- Do a primary survey of the victim. Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.
- Phone Emergency Medical Services (EMS). Give the location, telephone number used, caller’s name, what happened, number of victims, victim’s condition, and help being given.
- Maintain airway and perform rescue breathing as necessary.
- Perform CPR as necessary.
- Do a secondary survey of the victim. Check vital signs and do a head-to-toe exam.

Treat other conditions as necessary. If the victim can be moved, take him/her to a location away from the work area where EMS can gain access.

10.4 FIRST AID GENERAL

All persons must report any injury or illness to their immediate supervisor or the FS. Trained personnel will provide first aid. Injuries and illnesses requiring medical treatment must be documented. The FS and SSO must fill out an accident/incident report as soon as emergency conditions no longer exist and first aid and/or medical treatment has been ensured. The report must be completed and submitted to the PM within 24 hours after the incident.

If first-aid treatment is required, first aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured person(s) should be transported to the medical facility. If the injured person is not ambulatory or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance/paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

10.4.1 FIRST AID—INHALATION

Any employee complaining of symptoms of chemical overexposure as described in Section 4, General Site Safety Procedures, will be removed from the work area and transported to the designated medical facility for examination and treatment.

10.4.2 FIRST AID—INGESTION

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information. If the victim is unconscious, keep them on their side and clear the airway if vomiting occurs.

10.4.3 FIRST AID—SKIN CONTACT

Project personnel who have had skin contact with contaminants will, unless the contact is severe, proceed through the CRZ, to the wash area. Personnel will remove any contaminated clothing, and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he/she shows any sign of skin reddening, irritation, or if he/she requests a medical examination.

10.4.4 FIRST AID—EYE CONTACT

Project personnel who have had contaminants splashed in their eyes or who have experienced eye irritation while in the EZ, must immediately proceed to the eyewash station in the CRZ. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

10.5 REPORTING INJURIES, ILLNESSES, AND SAFETY INCIDENTS

Injuries and illnesses, however minor, will be reported to the FS immediately. The FS will complete an injury report and submit it to the HSM, and the PM by end of shift.

10.6 EMERGENCY INFORMATION

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the daily safety meeting. These agencies are identified in **Table 10.1** below.

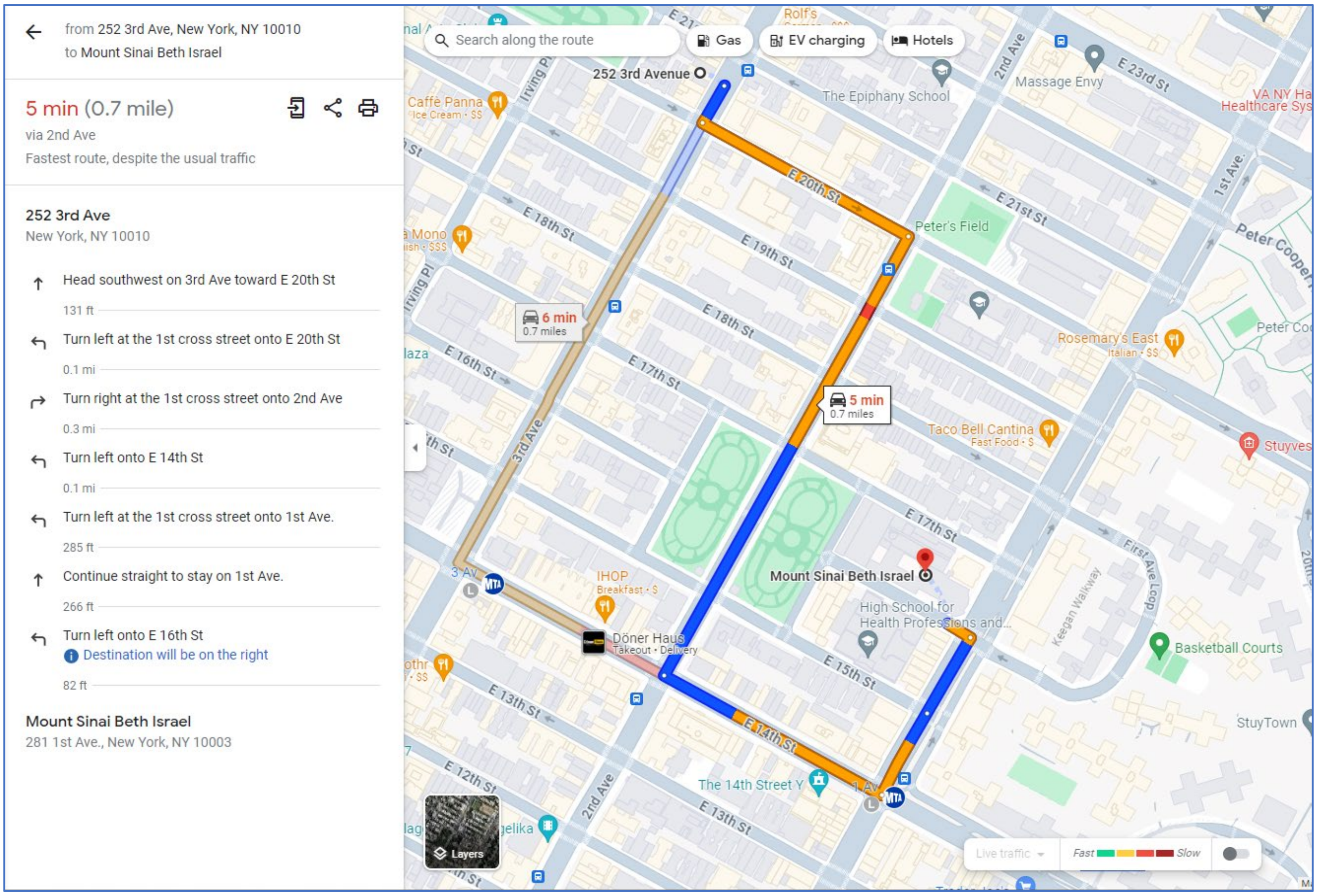
Table 10.1 – Emergency Contacts

Local Emergency Contacts	**Telephone No.**
EMERGENCY	911
Mount Sinai Beth Israel	212-420-2000 212-857-9980
Police Emergency	911
Fire Emergency	911
Rescue Squad	911
Ambulance	911
Miscellaneous Contacts	**Telephone No.**
N.Y. Poison Control Center	(800) 222-1222
National Response Center and Terrorist Hotline	(800) 424-8802
Center for Disease Control	(800) 311-3435
Utility Mark-Out	(800) 962-7962

10.6.1 DIRECTIONS TO HOSPITAL

Mount Sinai Beth Israel
281 First Avenue (First Avenue at 16th Street)
New York, NY 10003
212-420-2000
212-857-9980

Figure 10.1: Directions to Hospital (Mount Sinai Beth Israel)



from 252 3rd Ave, New York, NY 10010
to Mount Sinai Beth Israel

5 min (0.7 mile)
via 2nd Ave
Fastest route, despite the usual traffic

252 3rd Ave
New York, NY 10010

↑ Head southwest on 3rd Ave toward E 20th St
131 ft

↰ Turn left at the 1st cross street onto E 20th St
0.1 mi

↱ Turn right at the 1st cross street onto 2nd Ave
0.3 mi

↰ Turn left onto E 14th St
0.1 mi

↰ Turn left at the 1st cross street onto 1st Ave.
285 ft

↑ Continue straight to stay on 1st Ave.
266 ft

↰ Turn left onto E 16th St
Destination will be on the right
82 ft

Mount Sinai Beth Israel
281 1st Ave., New York, NY 10003

11.0 LOGS, REPORTS, AND RECORDKEEPING

11.1 HASP AND FIELD CHANGE REPORT

The following is a summary of required health and safety logs, reports, and record keeping for the operations at the subject Site.

11.2 MEDICAL AND TRAINING RECORDS

The HSM must obtain and keep a log of personnel meeting appropriate training and medical qualifications for the site work. The log will be kept in the project file. Each company's Human Resources Department will maintain medical records, in accordance with 29 CFR 1910.1020.

11.3 EXPOSURE RECORDS

Any personnel monitoring results, laboratory reports, calculations, and air sampling data sheets are part of an employee exposure record. These records will be kept in accordance with 29 CFR 1910.1020. For SESI employees, the originals will be sent to the Human Resources Manager. For subcontractor employees, the original file will be sent to the subcontractor employer with a copy maintained in the SESI project file.

11.4 ACCIDENT/INCIDENT REPORT

Any accident/incident reports must be completed following procedures given in Section 10.5 of this HASP. The originals will be sent to the HSM for maintenance. A copy of the forms will be kept in the project file. (See Attachment 4)

11.5 OSHA FORM 200

An OSHA Form 200 (Log of Occupational Injuries and Illnesses) will be kept at the project Site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the Human Resources Manager for maintenance. Subcontractor employees must also meet the requirements of maintaining an OSHA 200 Form. The accident/incident report meets the requirements of OSHA Form 101 (Supplemental Record), which must be maintained with the OSHA Form 200 for all recordable injuries or illnesses.

11.6 ON-SITE HEALTH AND SAFETY FIELD LOGBOOK

The HSM or designee will maintain an on-Site health and safety logbook in which daily Site conditions, activities, personnel, and significant events will be recorded. Calibration records and personnel monitoring results, if available, will also be recorded in the field logbook. The original logbook will be kept in the project file.

Whenever any personnel monitoring is conducted onsite, the monitoring results will be noted in the filed logbook. These will become part of the exposure records file and will be maintained by the HSM.

A signatory page is included (See Attachment 5) and is to be signed by those working on and/or visiting the Site.

11.7 MATERIAL DATA SAFETY SHEETS

Material Safety Data Sheets (MSDS) will be obtained and kept on file at the project site for each hazardous chemical brought to, use, or stored at the Site (See Attachment 6).

12.0 COVID RESPONSE ACTION PLAN

SESI is concerned with the safety and well-being of its employees, vendors, subcontractors, and others with access to its offices and job sites, with particular emphasis on the unique challenges posed by COVID-19.

SESI has established the following protocols in keeping with the recommendations of the CDC and other sources including State Governor Executive Orders for work taking place on construction sites.

We request that all SESI employees, vendors, and subcontractors help with our prevention efforts while at work.

In order to minimize the spread of COVID-19, we must all cooperate in doing the following:

- Frequently wash your hands with soap and water for at least 20 seconds. When soap and running water are unavailable, use an alcohol-based hand rub with at least 60% alcohol. Always wash hands that are visibly soiled.
- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
- Discourage handshaking, avoid touching your eyes, nose, or mouth with unwashed hands.
- Limit the sharing of tools, machinery, equipment, phones, desks, and computers.
- Wear cloth face coverings on all construction sites.
- Avoid close contact with people who are sick.
- Employees who have symptoms (i.e., fever, cough, or shortness of breath) should notify their supervisor and stay home—DO NOT GO TO WORK.
- Sick employees should follow CDC-recommended steps. Employees should not return to work until the criteria to discontinue home isolation are met, in consultation with healthcare providers and state and local health departments.

The following are the specific jobsite protocols and response actions to be taken in the event someone on Site has been in contact with, or has themselves, the COVID-19 virus:

OFFICE/JOBSITE PROTOCOL

- If an employee/worker exhibits COVID-19 symptoms, the employee/worker must remain at home until he or she is symptom free for 72 hours (three [3] full days) without the use of fever-reducing or other symptom-altering medicines (e.g. acetaminophen, cough suppressants). SESI will similarly require an employee or worker that reports to work with symptoms to return home until they are symptom free for 72 hours (three [3] full days).
- Limit person to person contact, and when unavoidable, maintain CDC distancing guidelines.
- Avoid eating lunch in groups.

- Avoid in-person meetings if possible. If an in-person meeting is necessary, conduct it in a well-ventilated area with enough space for attendees to distance themselves from one another. Field jobsite meetings should be conducted in smaller group meetings (no more than five [5] persons when possible) versus one large meeting.
- Only workers necessary to the execution of the work should be at the jobsites. No non-essential visitors should be permitted at the worksite.

RESPONSE ACTION TRIGGER EVENTS:

- an employee/worker at work has tested positive for COVID-19
- an employee/worker at work has suspected, but unconfirmed, case of COVID-19
- an employee/worker self-reported that they came in contact with someone who had a presumptive positive case of COVID-19
- an employee/worker has been exposed to the virus but only found out after they have interacted with others

RESPONSE ACTIONS:

- Upon occurrence of any of the Trigger Events above, employees/subcontractors shall notify SESI Management about the suspected employee/worker infected with, or exposed to, COVID-19.
- SESI Management will investigate the incident to confirm the report is valid.
- Employees/Subcontractors shall investigate their respective infected employee(s) and report the following to SESI Management and HR:
  - Identify all individuals who worked in proximity (six feet) of the infected employee/worker,
  - Employee(s)/Worker(s) infected with the COVID-19 virus, and employee(s)/worker(s) that came in contact with the infected employee/worker shall be sent home for a period of 14 days,
  - Do not identify the infected employee/worker by name to avoid violation of privacy/confidentiality laws, and,
  - Keep SESI Management informed of progress and updates.

- If an infected person was in the office, SESI will clean and disinfect common areas and surfaces, in accordance with CDC recommendations.
- SESI Management will notify affected employees/workers of the Trigger Event and instruct them to take the response actions above.

- **SESI Management policy requires written documentation from a health care professional that confirmed infected employees can return to work.**

Except for circumstances in which SESI is legally required to report workplace occurrences of communicable disease, the confidentiality of all medical conditions will be maintained in accordance with applicable law and to the extent practical under the circumstances. When required, the number of persons who will be informed of an employee's/worker's condition will be kept at the minimum needed to appropriately notify other potentially affected employees/workers of Trigger Events and to attempt to minimize the potential for transmission of the virus.

ATTACHMENT 1

AIR MONITOR LOG

Air Monitoring: Sample Collection and Analysis

Date & Time of Monitoring	Task / Operation Being	Substance(s)/ Hazard(s) Being	Monitoring Location	Type/Method of Monitoring (separate lines for	Monitoring Results	Exposure Limits	Required Action

ATTACHMENT 2

OSHA POSTER

Job Safety and Health

It's the law!

OSHA®

Occupational Safety and Health Administration
U.S. Department of Labor

EMPLOYEES:

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.

- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in that inspection.

- You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.

- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.

- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.

- You have the right to copies of your medical records and records of your exposures to toxic and harmful substances or conditions.

- Your employer must post this notice in your workplace.

- You must comply with all occupational safety and health standards issued under the *OSH Act* that apply to your own actions and conduct on the job.

EMPLOYERS:

- You must furnish your employees a place of employment free from recognized hazards.

- You must comply with the occupational safety and health standards issued under the *OSH Act*.

Free assistance in identifying and correcting hazards or complying with standards is available to employers, without citation or penalty, through OSHA-supported consultation programs in each state.

This free poster available from OSHA –
The Best Resource for Safety and Health

1-800-321-OSHA (6742)
www.osha.gov

OSHA 3165-02 2012R

ATTACHMENT 3

FILED CHANGE REQUEST FORM

HEALTH & SAFETY PLAN
CHANGE NOTICE

Pages _____ of _____

Project: H&S-CN

1) HASP VERSION: _____ SECTION: _____ PAGE (s): _____

RE:
--- Change to existing HASP Anticipated Revision Date: __________
--- Addition to existing HASP
--- Other: ____
____CONT._______

2) PROPOSED CHANGE: ____
____
____
____

3) REASON FOR PROPOSED CHANGE(s):
--- Required by SPEC or Change Order --- Other: _________________________
--- Disposition of Deficiency _______________CONT.______
--- Change in Regulatory or Other Requirements
--- Operational Experience

4) EXHIBITS ATTACHED ____ NO ____ YES (If YES, describe) ________________________________
________________________CONT._____

5) PMK APPROVALS
PROJECT MANAGER: _______________________________ Date: ________
SITE MANAGER: _________________________________ Date: ________
H&S MANAGER: _________________________________ Date: ________

Client Approval Required: ____ NO ____ YES (If YES, date submitted) __________________________

6) CLIENT APPROVAL _____ APPROVED _____ REMANDED _____ REJECTED

Comments: ____
____
____ CONT.__________

Client Representative: ____Date: ________

7) DISTRIBUTION AFTER APPROVAL

X HASP UPDATE LIST --- OTHER: _______________
X CLIENT _______________
X PROJECT FILES _______________

8) PREPARED BY: ____Date: _______
Title: ____

ATTACHMENT 4

INJURY REPORT FORM

OSHA's Form 301

Injury and Illness Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary*, these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by ______________________________

Title ______________________________

Phone (_____)______-________ Date ___/___/___

Information about the employee

1) Full name ______________________________

2) Street ______________________________

City ____________________ State ______ ZIP ______

3) Date of birth ___/___/___

4) Date hired ___/___/___

5) ☐ Male
☐ Female

Information about the physician or other health care professional

6) Name of physician or other health care professional ______________________________

____

7) If treatment was given away from the worksite, where was it given?

Facility ______________________________

Street ______________________________

City ____________________ State ______ ZIP ______

8) Was employee treated in an emergency room?
☐ Yes
☐ No

9) Was employee hospitalized overnight as an in-patient?
☐ Yes
☐ No

Information about the case

10) Case number from the *Log* ____________ *(Transfer the case number from the Log after you record the case.)*

11) Date of injury or illness ___/___/___

12) Time employee began work ____________ AM / PM

13) Time of event ____________ AM / PM ☐ Check if time cannot be determined

14) ***What was the employee doing just before the incident occurred?*** Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific. *Examples:* "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."

15) ***What happened?*** Tell us how the injury occurred. *Examples:* "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."

16) ***What was the injury or illness?*** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or sore." *Examples:* "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."

17) ***What object or substance directly harmed the employee?*** *Examples:* "concrete floor"; "chlorine"; "radial arm saw." *If this question does not apply to the incident, leave it blank.*

18) ***If the employee died, when did death occur?*** Date of death ___/___/___

Public reporting burden for this collection of information is estimated to average 22 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Persons are not required to respond to the collection of information unless it displays a current valid OMB control number. If you have any comments about this estimate or any other aspects of this data collection, including suggestions for reducing this burden, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20___

U.S. Department of Labor

Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name ______________________

City ______________ State ________

Identify the person			Describe the case			Classify the case CHECK ONLY ONE box for each case based on the most serious outcome for that case:		Remained at Work		Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:					
(A) Case no.	(B) Employee's name	(C) Job title (*e.g., Welder*)	(D) Date of injury or onset of illness	(E) Where the event occurred (*e.g., Loading dock north end*)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (*e.g., Second degree burns on right forearm from acetylene torch*)	Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other recordable cases (J)	Away from work (K)	On job transfer or restriction (L)	(M) Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
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			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
			___/___ month/day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
					Page totals➤	___	___	___	___	___	___	___ Injury (1)	___ Skin disorder (2)	___ Respiratory condition (3)	___ Poisoning (4)	___ Hearing loss (5)	___ All other illnesses (6)

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Page ___ **of** ___

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year 20__ __

U.S. Department of Labor

Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
______	______	______	______
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
______	______
(K)	(L)

Injury and Illness Types

Total number of . . .

(M)

(1) Injuries	____	(4) Poisonings	____
(2) Skin disorders	____	(5) Hearing loss	____
(3) Respiratory conditions	____	(6) All other illnesses	____

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name ____________________

Street ____________________

City ____________ State ____ ZIP ______

Industry description (*e.g., Manufacture of motor truck trailers*)

____

Standard Industrial Classification (SIC), if known (*e.g., 3715*)

__ __ __ __

OR

North American Industrial Classification (NAICS), if known (e.g., 336212)

__ __ __ __ __ __

Employment information

(If you don't have these figures, see the Worksheet on the back of this page to estimate.)

Annual average number of employees ________

Total hours worked by all employees last year ________

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company executive ____________ Title

( ) - ____________ / /

Phone ____________ Date

ATTACHMENT 5

SIGNATORY PAGE

Attachment 4 – Site-Specific Health and Safety Orientation Signatory Page
HEALTH AND SAFETY PLAN

Title	**Name**	**Signature**
Project Manager:	TBD	
Health and Safety Manager:	TBD	

I have read the attached Health and Safety Plan (HASP)and have received site-specific information and orientation regarding the identified physical, chemical, and biological hazards anticipated at this site. My signature certifies that I understand the procedures, equipment, and restrictions applicable to this project site and agree to abide by them.

Signature	**Printed Name**	**Company**	**Date**

Attachment 4 – Health and Safety Orientation Signatory Page (continued)

Signature	Printed Name	Company	Date

Attachment 6

Material Safety Data Sheets

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

ASBESTOS
CAS # 1332-21-4

Division of Toxicology ToxFAQs™ **September 2001**

This fact sheet answers the most frequently asked health questions (FAQs) about asbestos. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, individual susceptibility and personal habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to asbestos usually occurs by breathing contaminated air in workplaces that make or use asbestos. Asbestos is also found in the air of buildings that are being torn down or renovated. Asbestos exposure can cause serious lung problems and cancer. This substance has been found at 83 of the 1,585 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is asbestos?

Asbestos is the name given to a group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite) that occur naturally in the environment. Asbestos minerals have separable long fibers that are strong and flexible enough to be spun and woven and are heat resistant. Because of these characteristics, asbestos has been used for a wide range of manufactured goods, mostly in building materials (roofing shingles, ceiling and floor tiles, paper products, and asbestos cement products), friction products (automobile clutch, brake, and transmission parts), heat-resistant fabrics, packaging, gaskets, and coatings. Some vermiculite or talc products products may contain asbestos.

What happens to asbestos when it enters the environment?

Asbestos fibers can enter the air or water from the breakdown of natural deposits and manufactured asbestos products. Asbestos fibers do not evaporate into air or dissolve in water. Small diameter fibers and particles may remain suspended in the air for a long time and be carried long distances by wind or water before settling down. Larger diameter fibers and particles tend to settle more quickly.

Asbestos fibers are not able to move through soil. Asbestos fibers are generally not broken down to other compounds and will remain virtually unchanged over long periods.

How might I be exposed to asbestos?

We are all exposed to low levels of asbestos in the air we breathe. These levels range from 0.00001 to 0.0001 fibers per milliliter of air and generally are highest in cities and industrial areas.

People working in industries that make or use asbestos products or who are involved in asbestos mining may be exposed to high levels of asbestos. People living near these industries may also be exposed to high levels of asbestos in air.

Asbestos fibers may be released into the air by the disturbance of asbestos-containing material during product use, demolition work, building or home maintenance, repair, and remodeling. In general, exposure may occur only when the asbestos-containing material is disturbed in some way to release particles and fibers into the air.

Drinking water may contain asbestos from natural sources or from asbestos-containing cement pipes.

How can asbestos affect my health?

Asbestos mainly affects the lungs and the membrane that surrounds the lungs. Breathing high levels of asbestos fibers for a long time may result in scar-like tissue in the lungs and in the pleural membrane (lining) that surrounds the lung. This disease is called asbestosis and is usually found in workers exposed to asbestos, but not in the general public. People with asbestosis have difficulty breathing, often a cough, and in severe cases heart enlargement. Asbestosis is a serious disease and can eventually lead to disability and death.

Chromium - ToxFAQs™

CAS # 7440-47-3

This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and cause cancer. Ingesting high levels of chromium(VI) may result in anemia or damage to the stomach or intestines. Chromium(III) is an essential nutrient. Chromium has been found in at least 1,127 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- Chromium can be found in air, soil, and water after release from the manufacture, use, and disposal of chromium-based products, and during the manufacturing process.
- Chromium does not usually remain in the atmosphere, but is deposited into the soil and water.
- Chromium can easily change from one form to another in water and soil, depending on the conditions present.
- Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- Eating food containing chromium(III).
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Drinking contaminated well water.
- Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems, such as asthma, cough, shortness of breath, or wheezing. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III).

The main health problems seen in animals following ingestion of chromium(VI) compounds are irritation and ulcers in the stomach and small intestine and anemia. Chromium(III) compounds are much less toxic and do not appear to cause these problems.

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive tochromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that chromium(VI) compounds are known human carcinogens.

In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Chromium(VI) also causes lung cancer in animals. An increase in stomach tumors was observed in humans and animals exposed to chromium(VI) in drinking water.

How can chromium affect children?

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Some developmental effects have been observed in animals exposed to chromium(VI).

How can families reduce the risk of exposure to chromium?

- Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.
- Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to determine whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. Chromium can be measured in hair, urine, and blood.

Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The EPA has established a maximum contaminant level of 0.1 mg/L for total chromium in drinking water.

The FDA has determined that the chromium concentration in bottled drinking water should not exceed 0.1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.005 mg/m^3 chromium(VI), 0.5 mg/m^3 chromium(III), and 1.0 mg/m^3 chromium(0) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Vinyl Chloride - ToxFAQs™

CAS # 75-01-4

This fact sheet answers the most frequently asked health questions (FAQs) about vinyl chloride. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to vinyl chloride occurs mainly in the workplace. Breathing high levels of vinyl chloride for short periods of time can cause dizziness, sleepiness, unconsciousness, and at extremely high levels can cause death. Breathing vinyl chloride for long periods of time can result in permanent liver damage, immune reactions, nerve damage, and liver cancer. This substance has been found in at least 616 of the 1,662 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is vinyl chloride?

Vinyl chloride is a colorless gas. It burns easily and it is not stable at high temperatures. It has a mild, sweet odor. It is a manufactured substance that does not occur naturally. It can be formed when other substances such as trichloroethane, trichloroethylene, and tetrachloroethylene are broken down. Vinyl chloride is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials.

Vinyl chloride is also known as chloroethene, chloroethylene, and ethylene monochloride.

What happens to vinyl chloride when it enters the environment?

- Liquid vinyl chloride evaporates easily. Vinyl chloride in water or soil evaporates rapidly if it is near the surface.
- Vinyl chloride in the air breaks down in a few days to other substances, some of which can be harmful.
- Small amounts of vinyl chloride can dissolve in water.
- Vinyl chloride is unlikely to build up in plants or animals that you might eat.

How might I be exposed to vinyl chloride?

- Breathing vinyl chloride that has been released from plastics industries, hazardous waste sites, and landfills.
- Breathing vinyl chloride in air or during contact with your skin or eyes in the workplace.
- Drinking water from contaminated wells.

How can vinyl chloride affect my health?

Breathing high levels of vinyl chloride can cause you to feel dizzy or sleepy. Breathing very high levels can cause you to pass out, and breathing extremely high levels can cause death.

Some people who have breathed vinyl chloride for several years have changes in the structure of their livers. People are more likely to develop these changes if they breathe high levels of vinyl chloride. Some people who work with vinyl chloride have nerve damage and develop immune reactions. The lowest levels that produce liver changes, nerve damage, and immune reaction in people are not known. Some workers exposed to very high levels of vinyl chloride have problems with the blood flow in their hands. Their fingers turn white and hurt when they go into the cold.

The effects of drinking high levels of vinyl chloride are unknown. If you spill vinyl chloride on your skin, it will cause numbness, redness, and blisters.

Animal studies have shown that long-term exposure to vinyl chloride can damage the sperm and testes.

Vinyl Chloride

CAS # 75-01-4

How likely is vinyl chloride to cause cancer?

The U.S. Department of Health and Human Services (DHHS) has determined that vinyl chloride is a known carcinogen. Studies in workers who have breathed vinyl chloride over many years showed an increased risk of liver, brain, lung cancer, and some cancers of the blood have also been observed in workers.

How can vinyl chloride affect children?

It has not been proven that vinyl chloride causes birth defects in humans, but studies in animals suggest that vinyl chloride might affect growth and development. Animal studies also suggest that infants and young children might be more susceptible than adults to vinyl chloride-induced cancer.

How can families reduce the risk of exposure to vinyl chloride?

Tobacco smoke contains low levels of vinyl chloride, so limiting your family's exposure to cigarette or cigar smoke may help reduce their exposure to vinyl chloride.

Is there a medical test to determine whether I've been exposed to vinyl chloride?

The results of several tests can sometimes show if you have been exposed to vinyl chloride. Vinyl chloride can be measured in your breath, but the test must be done shortly after exposure. This is not helpful for measuring very low levels of vinyl chloride.

The amount of the major breakdown product of vinyl chloride, thiodiglycolic acid, in the urine may give some information about exposure. However, this test must be done shortly after exposure and does not reliably indicate the level of exposure.

Has the federal government made recommendations to protect human health?

Vinyl chloride is regulated in drinking water, food, and air. The EPA requires that the amount of vinyl chloride in drinking water not exceed 0.002 milligrams per liter (mg/L) of water.

The Occupational Safety and Health Administration (OSHA) has set a limit of 1 part vinyl chloride per 1 million parts of air (1 ppm) in the workplace.

The Food and Drug Administration (FDA) regulates the vinyl chloride content of various plastics. These include plastics that carry liquids and plastics that contact food. The limits for vinyl chloride content vary depending on the nature of the plastic and its use.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Vinyl Chloride (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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BARIUM AND COMPOUNDS

CAS # 7440-39-3

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about barium and barium compounds. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to barium occurs mostly in the workplace or from drinking contaminated water. Ingesting drinking water containing levels of barium above the EPA drinking water guidelines for relatively short periods of time can cause gastrointestinal disturbances and muscle weakness. Ingesting high levels for a long time can damage the kidneys. Barium and barium compounds have been found in at least 798 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is barium?

Barium is a silvery-white metal which exists in nature only in ores containing mixtures of elements. It combines with other chemicals such as sulfur or carbon and oxygen to form barium compounds.

Barium compounds are used by the oil and gas industries to make drilling muds. Drilling muds make it easier to drill through rock by keeping the drill bit lubricated. They are also used to make paint, bricks, ceramics, glass, and rubber.

Barium sulfate is sometimes used by doctors to perform medical tests and to take x-rays of the gastrointestinal tract.

What happens to barium when it enters the environment?

❏ Barium gets into the air during the mining, refining, and production of barium compounds, and from the burning of coal and oil.
❏ The length of time that barium will last in air, land, water, or sediments depends on the form of barium released.
❏ Barium compounds, such as barium sulfate and barium carbonate, which do not dissolve well in water, can last a long time in the environment.
❏ Barium compounds, such as barium chloride, barium nitrate, or barium hydroxide, that dissolve easily in water usually do not last in these forms for a long time in the environment. The barium in these compounds that is dissolved in water quickly combines with sulfate or carbonate that are naturally found in water and become the longer lasting forms (barium sulfate and barium carbonate).
❏ Fish and aquatic organisms can accumulate barium.

How might I be exposed to barium?

❏ Ingesting small amounts present in your food and water or breathing air containing very low levels of barium.
❏ Living in areas with unusually high natural levels of barium in the drinking water.
❏ Working in a job that involves barium production or use.
❏ Living or working near waste sites where barium has been disposed of.

How can barium affect my health?

The health effects of the different barium compounds depend on how well the compound dissolves in water or in the stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are not generally harmful.

BARIUM AND COMPOUNDS

CAS # 7440-39-3

Barium has been found to potentially cause gastrointestinal disturbances and muscular weakness when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time. Some people who eat or drink amounts of barium above background levels found in food and water for a short period may experience vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness. Eating or drinking very large amounts of barium compounds that easily dissolve can cause changes in heart rhythm or paralysis and possibly death. Animals that drank barium over long periods had damage to the kidneys, decreases in body weight, and some died.

How likely is barium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified barium as to its carcinogenicity. The EPA has determined that barium is not likely to be carcinogenic to humans following ingestion and that there is insufficient information to determine whether it will be carcinogenic to humans following inhalation exposure.

How can barium affect children?

We do not know whether children will be more or less sensitive than adults to barium toxicity. A study in rats that swallowed barium found a decrease in newborn body weight; we do not know if a similar effect would be seen in humans.

How can families reduce the risks of exposure to barium?

The greatest potential source of barium exposure is through food and drinking water. However, the amount of barium in foods and drinking water are typically too low to be of concern.

Is there a medical test to determine whether I've been exposed to barium?

There is no routine medical test to determine whether you have been exposed to barium. Doctors can measure barium in body tissues and fluids, such as bones, blood, urine, and feces, using very complex instruments. These tests cannot be used to predict the extent of the exposure or potential health effects.

The geometric mean barium level measured in the U.S. general population aged 6 and older is reported by the Centers for Disease Control and Prevention (CDC) as 1.44 µg/g creatinine (measured in urine).

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2.0 milligrams of barium per liter of drinking water (2.0 mg/L), which is the same as 2 ppm.

The Occupational Safety and Health Administration (OSHA) has set Permissible Exposure Limits (PELs) of 0.5 milligrams of soluble barium compounds per cubic meter of workplace air (0.5 mg/m^3) for 8 hour shifts and 40 hour work weeks. The OSHA limits for barium sulfate dust are 15 mg/m^3 of total dust and 5 mg/m^3 for respirable fraction.

The National Institute for Occupational Safety and Health (NIOSH) has set Recommended Exposure Limits (RELs) of 0.5 mg/m^3 for soluble barium compounds. The NIOSH has set RELs of 10 mg/m^3 (total dust) for barium sulfate and 5 mg/m^3 (respirable fraction).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Barium and Compounds (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Cadmium- ToxFAQs™

CAS # 7440-43-9

This fact sheet answers the most frequently asked health questions (FAQs) about cadmium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the kidneys, lungs, and bones. Cadmium has been found in at least 1,014 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is cadmium?

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide).

All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- Cadmium enters soil, water, and air from mining, industry, and burning coal and household wastes.
- Cadmium does not break down in the environment, but can change forms.
- Cadmium particles in air can travel long distances before falling to the ground or water.
- Some forms of cadmium dissolve in water.
- Cadmium binds strongly to soil particles.
- Fish, plants, and animals take up cadmium from the environment.

How might I be exposed to cadmium?

- Eating foods containing cadmium; low levels are found in all foods (highest levels are found in leafy vegetables, grains, legumes, and kidney meat).
- Smoking cigarettes or breathing cigarette smoke.
- Breathing contaminated workplace air.
- Drinking contaminated water.
- Living near industrial facilities which release cadmium into the air.

How can cadmium affect my health?

Breathing high levels of cadmium can severely damage the lungs. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea.

Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have determined that cadmium and cadmium compounds are human carcinogens. The EPA determined that cadmium is a probable human carcinogen (group B1).

Cadmium

CAS # 7440-43-9

How can cadmium affect children?

The health effects in children are expected to be similar to the effects seen in adults (kidney and lung damage depending on the route of exposure).

A few studies in animals indicate that younger animals absorb more cadmium than adults. Animal studies also indicate that the young are more susceptible than adults to a loss of bone and decreased bone strength from exposure to cadmium.

We don't know if cadmium causes birth defects in people. Studies in animals exposed to high levels of cadmium during pregnancy have resulted in harmful effects to the young. Young animals exposed to cadmium before birth have shown effects on behavior and learning. There is also some information from animal studies that high enough exposures to cadmium before birth can reduce body weights and affect the skeleton in the developing young.

How can families reduce the risk of exposure to cadmium?

- Do not allow children to play with batteries. Dispose of nickel-cadmium batteries properly.
- Cadmium is a component of tobacco smoke. Avoid smoking and smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- If you work with cadmium, use all safety precautions to avoid carrying cadmium-containing dust home from work on your clothing, skin, hair, or tools.
- A balanced diet can reduce the amount of cadmium taken into the body from food and drink.

Is there a medical test to determine whether I've been exposed to cadmium?

Cadmium can be measured in blood, urine, hair, or nails. Urinary cadmium has been shown to accurately reflect the amount of cadmium in the body.

The amount of cadmium in your blood shows your recent exposure to cadmium. The amount of cadmium in your urine shows both your recent and your past exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to cadmium in drinking water at concentrations of 0.04 milligrams per liter (0.04 mg/L) for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 0.005 mg/L cadmium is not expected to cause any adverse effects.

The Food and Drug Administration (FDA) has determined that the cadmium concentration in bottled drinking water should not exceed 0.005 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 5 $\mu g/m^3$ for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Cadmium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

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ToxFAQs^{TM} Internet address is http://www.atsdr.cdc.gov/toxfaq.html

Breathing lower levels of asbestos may result in changes called plaques in the pleural membranes. Pleural plaques can occur in workers and sometimes in people living in areas with high environmental levels of asbestos. Effects on breathing from pleural plaques alone are not usually serious, but higher exposure can lead to a thickening of the pleural membrane that may restrict breathing.

How likely is asbestos to cause cancer?

The Department of Health and Human Services (DHHS), the World Health Organization (WHO), and the EPA have determined that asbestos is a human carcinogen.

It is known that breathing asbestos can increase the risk of cancer in people. There are two types of cancer caused by exposure to asbestos: lung cancer and mesothelioma. Mesothelioma is a cancer of the thin lining surrounding the lung (pleural membrane) or abdominal cavity (the peritoneum). Cancer from asbestos does not develop immediately, but shows up after a number of years. Studies of workers also suggest that breathing asbestos can increase chances of getting cancer in other parts of the body (stomach, intestines, esophagus, pancreas, and kidneys), but this is less certain. Early identification and treatment of any cancer can increase an individual's quality of life and survival.

Cigarette smoke and asbestos together significantly increase your chances of getting lung cancer. Therefore, if you have been exposed to asbestos you should stop smoking. This may be the most important action that you can take to improve your health and decrease your risk of cancer.

How can asbestos affect children?

We do not know if exposure to asbestos will result in birth defects or other developmental effects in people. Birth defects have not been observed in animals exposed to asbestos.

It is likely that health effects seen in children exposed to high levels of asbestos will be similar to the effects seen in adults.

How can families reduce the risk of exposure to asbestos?

Materials containing asbestos that are not disturbed or deteriorated do not, in general, pose a health risk and can be left alone. If you suspect that you may be exposed to asbestos in your home, contact your state or local health department or the regional offices of EPA to find out how to test your home and how to locate a company that is trained to remove or contain the fibers.

Is there a medical test to show whether I've been exposed to asbestos?

Low levels of asbestos fibers can be measured in urine, feces, mucus, or lung washings of the general public. Higher than average levels of asbestos fibers in tissue can confirm exposure but not determine whether you will experience any health effects.

A thorough history, physical exam, and diagnostic tests are needed to evaluate asbestos-related disease. Chest x-rays are the best screening tool to identify lung changes resulting from asbestos exposure. Lung function tests and CAT scans also assist in the diagnosis of asbestos-related disease.

Has the federal government made recommendations to protect human health?

In 1989, EPA banned all new uses of asbestos; uses established before this date are still allowed. EPA established regulations that require school systems to inspect for damaged asbestos and to eliminate or reduce the exposure by removing the asbestos or by covering it up. EPA regulates the release of asbestos from factories and during building demolition or renovation to prevent asbestos from getting into the environment.

EPA has proposed a concentration limit of 7 million fibers per liter of drinking water for long fibers (lengths greater than or equal to 5 µm). The Occupational Safety and Health Administration has set limits of 100,000 fibers with lengths greater than or equal to 5 µm per cubic meter of workplace air for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2001. Toxicological Profile for Asbestos. Update. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs^{TM} Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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BENZENE

CAS # 71-43-2

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 813 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is benzene?

(Pronounced běn′zēn′)

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

- ☐ Industrial processes are the main source of benzene in the environment.
- ☐ Benzene can pass into the air from water and soil.
- ☐ It reacts with other chemicals in the air and breaks down within a few days.
- ☐ Benzene in the air can attach to rain or snow and be carried back down to the ground.
- ☐ It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- ☐ Benzene does not build up in plants or animals.

How might I be exposed to benzene?

- ☐ Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- ☐ Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.
- ☐ Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- ☐ Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.
- ☐ People working in industries that make or use benzene may be exposed to the highest levels of it.
- ☐ A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

The major effect of benzene from long-term (365 days or longer) exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.

Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How likely is benzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

Is there a medical test to show whether I've been exposed to benzene?

Several tests can show if you have been exposed to benzene. There is test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood, however, since benzene disappears rapidly from the blood, measurements are accurate only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 0.005 milligrams per liter (0.005 mgL). The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 1 part of benzene per million parts of air (1 ppm) in the workplace during an 8-hour workday, 40-hour workweek.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Chromosomes: Parts of the cells responsible for the development of hereditary characteristics.

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Benzene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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CARBON DISULFIDE

CAS # 75-15-0

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

This fact sheet answers the most frequently asked health questions (FAQs) about carbon disulfide. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to carbon disulfide can occur by breathing it in the air and by drinking water or eating foods that contain it. Breathing very high levels can be life threatening because of its effects on the nervous system. Breathing low levels for long periods may result in headaches, tiredness, trouble sleeping, and slight changes in the nerves. Carbon disulfide has been found in at least 210 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is carbon disulfide?
(Pronounced kär′bən dī-sŭl′fīd′)

Pure carbon disulfide is a colorless liquid with a pleasant odor that is like the smell of chloroform. The impure carbon disulfide that is usually used in most industrial processes is a yellowish liquid with an unpleasant odor, like that of rotting radishes.

Carbon disulfide evaporates at room temperature, and the vapor is more than twice as heavy as air. It easily explodes in air and also catches fire very easily.

In nature, small amounts of carbon disulfide are found in gases released to the earth's surface as, for example, in volcanic eruptions or over marshes. Commercial carbon disulfide is made by combining carbon and sulfur at very high temperatures.

What happens to carbon disulfide when it enters the environment?

- ❑ The amount of carbon disulfide released into the air through natural processes is difficult to judge because it is so small.
- ❑ Carbon disulfide evaporates rapidly when released to the environment.
- ❑ Most carbon disulfide in the air and surface water is from manufacturing and processing activities.
- ❑ It is found naturally in coastal and ocean waters.
- ❑ Carbon disulfide does not stay dissolved in water very long, and it also moves through soils fairly quickly.
- ❑ Carbon disulfide does not appear to be taken up in significant amounts by the organisms living in water.

How might I be exposed to carbon disulfide?

- ❑ The people most often exposed to carbon disulfide are workers in plants that use carbon disulfide in their manufacturing processes.
- ❑ People may be exposed by breathing air, drinking water, or eating foods that contain it.
- ❑ People may also be exposed through skin contact with soil, water, or other substances that contain carbon disulfide.

How can carbon disulfide affect my health?

At very high levels, carbon disulfide may be life-threatening because of its effects on the nervous system. People who breathed carbon disulfide near an accident involving a railroad car showed changes in breathing and some chest pains.

Some workers who breathed high levels during working hours for at least 6 months had headaches, tiredness, and trouble sleeping. However, these workers may have been exposed to other chemicals besides carbon disulfide. Among workers who breathed lower levels, some developed very slight changes in their nerves.

Studies in animals indicate that carbon disulfide can affect the normal functions of the brain, liver, and heart. After pregnant rats breathed carbon disulfide in the air, some of the newborn rats died or had birth defects.

High concentrations of carbon disulfide have caused skin burns when the chemical accidentally touched people's skin.

How likely is carbon disulfide to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified carbon disulfide for carcinogenicity.

There are no definitive data in humans or animals that indicate a carcinogenic potential for carbon disulfide.

Is there a medical test to show whether I’ve been exposed to carbon disulfide?

One chemical test using urine can be done to tell whether the levels of breakdown substances from carbon disulfide are higher than normal. However, the test is not specific for carbon disulfide exposure.

A second test based on a specific breakdown substance is more sensitive and specific. It also requires special equipment and cannot tell you exactly how much carbon disulfide you were exposed to or predict whether harmful effects will occur.

These tests aren’t available at most doctors’ offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA requires that spills or accidental releases into the environment of 100 pounds or more of carbon disulfide be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a limit of 20 parts of carbon disulfide per million parts of air (20 ppm) for an 8-hour workday for a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that workroom air levels of carbon disulfide not exceed 1 ppm for a 10-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Dissolve: To disappear gradually.

Evaporate: To change into vapor or a gas.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for Carbon Disulfide produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES
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CARBON TETRACHLORIDE

CAS # 56-23-5

Division of Toxicology ToxFAQs™ **August 2005**

This fact sheet answers the most frequently asked health questions (FAQs) about carbon tetrachloride. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Carbon tetrachloride does not occur naturally. Exposure to this substance results mostly from breathing air, drinking water, or coming in contact with soil that is contaminated with it. Exposure to very high amounts of carbon tetrachloride can damage the liver, kidneys, and nervous system. Carbon tetrachloride can cause cancer in animals. Carbon tetrachloride has been found in at least 425 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is carbon tetrachloride?

Carbon tetrachloride is a manufactured chemical that does not occur naturally. It is a clear liquid with a sweet smell that can be detected at low levels. It is also called carbon chloride, methane tetrachloride, perchloromethane, tetrachloroethane, or benziform.

Carbon tetrachloride is most often found in the air as a colorless gas. It is not flammable and does not dissolve in water very easily. It was used in the production of refrigeration fluid and propellants for aerosol cans, as a pesticide, as a cleaning fluid and degreasing agent, in fire extinguishers, and in spot removers. Because of its harmful effects, these uses are now banned and it is only used in some industrial applications.

What happens to carbon tetrachloride when it enters the environment?

❑ It moves very quickly into the air upon release, so most of it is in the air.

❑ It evaporates quickly surface water.

❑ Only a small amount sticks to soil particles; the rest evaporates or moves into the groundwater.

❑ It is very stable in air (lifetime 30-100 years).

❑ It can be broken down or transformed in soil and water within several days.

❑ When it does break down, it forms chemicals that can destroy ozone in the upper atmosphere.

❑ It does not build up in animals. We do not know if it build up in plants.

How might I be exposed to carbon tetrachloride?

❑ Breathing contaminated air near manufacturing plants or waste sites.

❑ Breathing workplace air when it is used.

❑ Drinking contaminated water near manufacturing plants and waste sites.

❑ Breathing contaminated air and skin contact with water while showering or cooking with contaminated water.

❑ Swimming or bathing in contaminated water.

❑ Contact with or eating contaminated soil (pica child) at waste sites.

How can carbon tetrachloride affect my health?

High exposure to carbon tetrachloride can cause liver, kidney, and central nervous system damage. These effects can occur after ingestion or breathing carbon tetrachloride, and possibly from exposure to the skin. The liver is especially sensitive to carbon tetrachloride because it enlarges and cells are damaged or destroyed. Kidneys also are damaged, causing a build up of wastes in the blood. If exposure is low and brief, the liver and kidneys can repair the damaged cells and function normally again. Effects of carbon tetrachloride are more severe in persons who drink large amounts of alcohol.

If exposure is very high, the nervous system, including the brain, is affected. People may feel intoxicated and experience headaches, dizziness, sleepiness, and nausea and vomiting. These effects may subside if exposure is stopped, but in severe cases, coma and even death may occur.

There have been no studies of the effects of carbon tetrachloride on reproduction in humans, but studies in rats showed that long-term inhalation may cause decreased fertility.

How likely is carbon tetrachloride to cause cancer?

Studies in humans have not been able to determine whether or not carbon tetrachloride can cause cancer because usually there has been exposure to other chemicals at the same time. Swallowing or breathing carbon tetrachloride for years caused liver tumors in animals. Mice that breathed carbon tetrachloride also developed tumors of the adrenal gland.

The Department of Health and Human Services (DHHS) has determined that carbon tetrachloride may reasonably be anticipated to be a carcinogen. The International Agency for Research on Cancer (IARC) has determined that carbon tetrachloride is possibly carcinogenic to humans, whereas the EPA determined that carbon tetrachloride is a probable human carcinogen.

How can carbon tetrachloride affect children?

The health effects of carbon tetrachloride have not been studied in children, but they are likely to be similar to those seen in adults exposed to the chemical. We do not know whether children differ from adults in their susceptibility to carbon tetrachloride.

A few survey-type studies suggest that maternal drinking water exposure to carbon tetrachloride might possibly be related to certain birth defects. Studies in animals showed that carbon tetrachloride can cause early fetal deaths, but did not cause birth defects. A study with human breast milk in a test tube suggested that it would be possible for carbon tetrachloride to pass from the maternal circulation to breast milk, but there is no direct demonstration of this occurring.

How can families reduce the risks of exposure to carbon tetrachloride?

❏ Discard any product that contains carbon tetrachloride that you may have at home and may have used in the past.

❏ Household chemicals should be stored out of the reach of children in their original containers.

❏ Sometimes older children sniff household chemical products to get high. Talk to your children about the dangers of sniffing chemicals.

Is there a medical test to determine whether I've been exposed to carbon tetrachloride?

Several sensitive and specific tests are available to measure carbon tetrachloride in exposed persons. The most convenient way is simply to measure carbon tetrachloride in the exhaled air. Carbon tetrachloride also can be measured in blood, fat, or other tissues. These tests are not usually done in the doctor's office because they require special equipment. Although these tests can show that a person has been exposed to carbon tetrachloride, the results cannot be used to reliably predict whether any adverse health effect might result. Because carbon tetrachloride leaves the body fairly quickly, these methods are best suited to detecting exposures that have occurred within the last several days.

Has the federal government made recommendations to protect human health?

The EPA has set a limit for carbon tetrachloride in drinking water of 5 parts of carbon tetrachloride per billion parts of water (5 ppb). The EPA has also set limits on how much carbon tetrachloride can be released from an industrial plant into waste water and is preparing to set limits on how much carbon tetrachloride can escape from an industrial plant into outside air.

The Occupational Safety and Health Administration (OSHA) set a limit of 10 ppm for carbon tetrachloride in workplace air for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Carbon Tetrachloride (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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DDT, DDE, AND DDD

CAS # 50-29-3, 72-55-9, 72-54-8

Division of Toxicology ToxFAQs™ **September 2002**

This fact sheet answers the most frequently asked health questions (FAQs) about DDT, DDE, and DDD. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to DDT, DDE, and DDD occurs mostly from eating foods containing small amounts of these compounds, particularly meat, fish and poultry. High levels of DDT can affect the nervous system causing excitability, tremors and seizures. In women, DDE can cause a reduction in the duration of lactation and an increased chance of having a premature baby. DDT, DDE, and DDD have been found in at least 441 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are DDT, DDE, and DDD?

DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDT is a white, crystalline solid with no odor or taste. Its use in the U.S. was banned in 1972 because of damage to wildlife, but is still used in some countries.

DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT that contaminate commercial DDT preparations. DDE has no commercial use. DDD was also used to kill pests, but its use has also been banned. One form of DDD has been used medically to treat cancer of the adrenal gland.

What happens to DDT, DDE, and DDD when they enter the environment?

❏ DDT entered the environment when it was used as a pesticide; it still enters the environment due to current use in other countries.
❏ DDE enters the environment as contaminant or breakdown product of DDT; DDD also enters the environment as a breakdown product of DDT.
❏ DDT, DDE, and DDD in air are rapidly broken down by sunlight. Half of what's in air breaks down within 2 days.
❏ They stick strongly to soil; most DDT in soil is broken down slowly to DDE and DDD by microorganisms; half the DDT in soil will break down in 2-15 years, depending on the type of soil.
❏ Only a small amount will go through the soil into groundwater; they do not dissolve easily in water.
❏ DDT, and especially DDE, build up in plants and in fatty tissues of fish, birds, and other animals.

How might I be exposed to DDT, DDE, and DDD?

❏ Eating contaminated foods, such as root and leafy vegetables, fatty meat, fish, and poultry, but levels are very low.
❏ Eating contaminated imported foods from countries that still allow the use of DDT to control pests.
❏ Breathing contaminated air or drinking contaminated water near waste sites and landfills that may contain higher levels of these chemicals.
❏ Infants fed on breast milk from mothers who have been exposed.
❏ Breathing or swallowing soil particles near waste sites or landfills that contain these chemicals.

How can DDT, DDE, and DDD affect my health?

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months.

A study in humans showed that women who had high amounts of a form of DDE in their breast milk were unable to

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry

breast feed their babies for as long as women who had little DDE in the breast milk. Another study in humans showed that women who had high amounts of DDE in breast milk had an increased chance of having premature babies.

In animals, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the liver. Also in animals, short-term oral exposure to small amounts of DDT or its breakdown products may also have harmful effects on reproduction.

How likely are DDT, DDE, and DDD to cause cancer?

Studies in DDT-exposed workers did not show increases in cancer. Studies in animals given DDT with the food have shown that DDT can cause liver cancer.

The Department of Health and Human Services (DHHS) determined that DDT may reasonable be anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans. The EPA determined that DDT, DDE, and DDD are probable human carcinogens.

How can DDT, DDE, and DDD affect children?

There are no studies on the health effects of children exposed to DDT, DDE, or DDD. We can assume that children exposed to large amounts of DDT will have health effects similar to the effects seen in adults. However, we do not know whether children differ from adults in their susceptibility to these substances.

There is no evidence that DDT, DDE, or DDD cause birth defects in people. A study showed that teenage boys whose mothers had higher DDE amounts in the blood when they were pregnant were taller than those whose mothers had lower DDE levels. However, a different study found the opposite in preteen girls. The reason for the discrepancy between these studies is unknown.

Studies in rats have shown that DDT and DDE can mimic the action of natural hormones and in this way affect the development of the reproductive and nervous systems. Puberty was delayed in male rats given high amounts of DDE as juveniles. This could possibly happen in humans.

A study in mice showed that exposure to DDT during the first weeks of life may cause neurobehavioral problems later in life.

How can families reduce the risk of exposure to DDT,DDE, and DDE?

❑ Most families will be exposed to DDT by eating food or drinking liquids contaminated with small amounts of DDT.
❑ Cooking will reduce the amount of DDT in fish.
❑ Washing fruit and vegetables will remove most DDT from their surface.
❑ Follow health advisories that tell you about consumption of fish and wildlife caught in contaminated areas.

Is there a medical test to show whether I've been exposed to DDT, DDE, and DDD?

Laboratory tests can detect DDT, DDE, and DDD in fat, blood, urine, semen, and breast milk. These tests may show low, moderate, or excessive exposure to these compounds, but cannot tell the exact amount you were exposed to, or whether you will experience adverse effects. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) sets a limit of 1 milligram of DDT per cubic meter of air (1 mg/m^3) in the workplace for an 8-hour shift, 40-hour workweek.

The Food and Drug Administration (FDA) has set limits for DDT, DDE, and DDD in foodstuff at or above which the agency will take legal action to remove the products from the market.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for DDT/DDE/DDD (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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ETHYLBENZENE

CAS # 100-41-4

Agency for Toxic Substances and Disease Registry ToxFAQs June 1999

This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is ethylbenzene?

(Pronounced ĕth′ əl bĕn′ zēn′)

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

What happens to ethylbenzene when it enters the environment?

☐ Ethylbenzene moves easily into the air from water and soil.

☐ It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.

☐ Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.

☐ In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.

☐ In soil, it is broken down by soil bacteria.

How might I be exposed to ethylbenzene?

☐ Breathing air containing ethylbenzene, particularly in areas near factories or highways.

☐ Drinking contaminated tap water.

☐ Working in an industry where ethylbenzene is used or made.

☐ Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classifiable as to human carcinogenicity.

No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

Is there a medical test to show whether I've been exposed to ethylbenzene?

Ethylbenzene is found in the blood, urine, breath, and some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for ethylbenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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FUEL OILS

CAS # 8008-20-6, 70892-10-3, 68476-30-2, 68476-34-6, 68476-31-3

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about fuel oils. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are fuel oils?

(Pronounced fyo͞o′əl oilz)

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

What happens to fuel oils when they enter the environment?

- Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.
- Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- Some of the chemicals found in fuel oils may build up significantly in plants and animals.

How might I be exposed to fuel oils?

- Using a home kerosene heater or stove, or using fuel oils at work.
- Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- Touching soil contaminated with fuel oils.
- Using fuel oils to wash paint or grease from skin or equipment.

How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, lightheadedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m^3) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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LEAD

CAS # 7439-92-1

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- ❑ Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- ❑ When lead is released to the air, it may travel long distances before settling to the ground.
- ❑ Once lead falls onto soil, it usually sticks to soil particles.
- ❑ Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- ❑ Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- ❑ Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- ❑ Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.
- ❑ Using health-care products or folk remedies that contain lead.

How can lead affect my health?

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, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. 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 in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

❏ Avoid exposure to sources of lead.

❏ Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.

❏ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.

❏ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children

❏ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (μg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 μg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 μg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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MERCURY
CAS # 7439-97-6

Agency for Toxic Substances and Disease Registry ToxFAQs **April 1999**

This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List sites identified by the Environmental Protection Agency.

What is mercury?

(Pronounced mū̃r′kyə-rē)

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- ☐ Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- ☐ It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.
- ☐ Methylmercury may be formed in water and soil by small organisms called bacteria.
- ☐ Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- ☐ Eating fish or shellfish contaminated with methylmercury.
- ☐ Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- ☐ Release of mercury from dental work and medical treatments.
- ☐ Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- ☐ Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also can pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to show whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m^3) and 0.05 mg/m^3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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METHYLENE CHLORIDE

CAS # 75-09-2

Division of Toxicology ToxFAQs™ **February 2001**

This fact sheet answers the most frequently asked health questions (FAQs) about methylene chloride. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to methylene chloride occurs mostly from breathing contaminated air, but may also occur through skin contact or by drinking contaminated water. Breathing in large amounts of methylene chloride can damage the central nervous system. Contact of eyes or skin with methylene chloride can result in burns. Methylene chloride has been found in at least 882 of 1,569 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is methylene chloride?

Methylene chloride is a colorless liquid with a mild, sweet odor. Another name for it is dichloromethane. Methylene chloride does not occur naturally in the environment.

Methylene chloride is used as an industrial solvent and as a paint stripper. It may also be found in some aerosol and pesticide products and is used in the manufacture of photographic film.

What happens to methylene chloride when it enters the environment?

❏ Methylene chloride is mainly released to the environment in air. About half of the methylene chloride in air disappears in 53 to 127 days.

❏ Methylene chloride does not easily dissolve in water, but small amounts may be found in drinking water.

❏ We do not expect methylene chloride to build up in plants or animals.

How might I be exposed to methylene chloride?

❏ The most likely way to be exposed to methylene chloride is by breathing contaminated air.

❏ Breathing the vapors given off by products containing methylene chloride. Exposure to high levels of methylene chloride is likely if methylene chloride or a product containing it is used in a room with inadequate ventilation.

How can methylene chloride affect my health?

If you breathe in large amounts of methylene chloride you may feel unsteady, dizzy, and have nausea and a tingling or numbness of your finger and toes. A person breathing smaller amounts of methylene chloride may become less attentive and less accurate in tasks requiring hand-eye coordination. Skin contact with methylene chloride causes burning and redness of the skin.

How likely is methylene chloride to cause cancer?

We do not know if methylene chloride can cause cancer in humans. An increased cancer risk was seen in mice

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service
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breathing large amounts of methylene chloride for a long time.

The World Health Organization (WHO) has determined that methylene chloride may cause cancer in humans.

The Department of Health and Human Services (DHHS) has determined that methylene chloride can be reasonably anticipated to be a cancer-causing chemical.

The EPA has determined that methylene chloride is a probable cancer-causing agent in humans.

How can methylene chloride affect children?

It is likely that health effects seen in children exposed to high amounts of methylene chloride will be similar to the effects seen in adults. We do not know if methylene chloride can affect the ability of people to have children or if it causes birth defects. Some birth defects have been seen in animals inhaling very high levels of methylene chloride.

How can families reduce the risk of exposure to methylene chloride?

❏ Families may be exposed to methylene chloride while using products such as paint removers. Such products should always be used in well-ventilated areas and skin contact should be avoided.
❏ Children should not be allowed to remain near indoor paint removal activities.

Is there a medical test to show whether I've been exposed to methylene chloride?

❏ Several tests can measure exposure to methylene chloride. These tests are not routinely available in your doctor's office.
❏ Methylene chloride can be detected in the air you breathe out and in your blood. These tests are only useful for detecting exposures that have occurred within a few days.
❏ It is also possible to measure carboxyhemoglobin (a chemical formed in the blood as methylene chloride breaks down in the body) in the blood or formic acid (a breakdown product of methylene chloride) in the urine. These tests are not specific for methylene chloride.

Has the federal government made recommendations to protect human health?

❏ The EPA requires that releases of methylene chloride of 1,000 pounds or more be reported to the federal government.
❏ The EPA recommends that exposure of children to methylene chloride be limited to less than 10 milligrams per liter of drinking water (10 mg/L) for 1 day or 2 mg/L for 10 days.
❏ The Food and Drug Administration (FDA) has established limits on the amounts of methylene chloride that can remain after processing of spices, hops extract, and decaffeinated coffee.
❏ The Occupational Safety and Health Administration (OSHA) has set limits of 25 parts methylene chloride per million parts of workplace air (25 ppm) for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for methylene chloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs September 1996

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- ☐ PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- ☐ PAHs can occur in air attached to dust particles.
- ☐ Some PAH particles can readily evaporate into the air from soil or surface waters.
- ☐ PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- ☐ PAHs enter water through discharges from industrial and wastewater treatment plants.
- ☐ Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- ☐ Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- ☐ In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- ☐ PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- ☐ Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- ☐ Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- ☐ Coming in contact with air, water, or soil near hazardous waste sites.
- ☐ Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- ☐ Drinking contaminated water or cow's milk.

- ☐ Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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POLYCHLORINATED BIPHENYLS

Division of Toxicology ToxFAQs™ February 2001

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

❏ PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.

❏ PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.

❏ PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.

❏ PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

❏ Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.

❏ Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.

❏ Breathing air near hazardous waste sites and drinking contaminated well water.

❏ In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risk of exposure to PCBs?

❑ You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.

❑ Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.

❑ Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.

❑ If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

TRICHLOROETHYLENE
CAS # 79-01-6

Division of Toxicology ToxFAQs™ **July 2003**

This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death. Trichloroethylene has been found in at least 852 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is trichloroethylene?

Trichloroethylene (TCE) is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers.

Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical.

What happens to trichloroethylene when it enters the environment?

❑ Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time.

❑ Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air.

❑ Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time.

❑ Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment.

❑ Trichloroethylene does not build up significantly in plants and animals.

How might I be exposed to trichloroethylene?

❑ Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid.

❑ Drinking, swimming, or showering in water that has been contaminated with trichloroethylene.

❑ Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site.

❑ Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment.

How can trichloroethylene affect my health?

Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.

Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry

Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

Skin contact with trichloroethylene for short periods may cause skin rashes.

How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9th Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is "reasonably anticipated to be a human carcinogen." The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is "probably carcinogenic to humans."

Is there a medical test to show whether I've been exposed to trichloroethylene?

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.

The EPA has also developed regulations for the handling and disposal of trichloroethylene.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 100 parts of trichloroethylene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: The ability of a substance to cause cancer.
CAS: Chemical Abstracts Service.
Evaporate: To change into a vapor or gas.
Milligram (mg): One thousandth of a gram.
Nonflammable: Will not burn.
ppm: Parts per million.
Sediment: Mud and debris that have settled to the bottom of a body of water.
Solvent: A chemical that dissolves other substances.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Trichloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

TETRACHLOROETHYLENE
CAS # 127-18-4

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is tetrachloroethylene?
(Pronounced tĕt′rə-klôr′ ō-ĕth′ə-lēn′)

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

What happens to tetrachloroethylene when it enters the environment?

- ☐ Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- ☐ Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- ☐ In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- ☐ It does not appear to collect in fish or other animals that live in water.

How might I be exposed to tetrachloroethylene?

- ☐ When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- ☐ When you drink water containing tetrachloroethylene, you are exposed to it.

How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethylene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

Is there a medical test to show whether I've been exposed to tetrachloroethylene?

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be performed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Tetrachloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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TOLUENE

CAS # 108-88-3

Division of Toxicology ToxFAQs™ February 2001

This fact sheet answers the most frequently asked health questions (FAQs) about toluene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

What happens to toluene when it enters the environment?

❑ Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petrolieum products as well as from leasking underground storage tanks at gasoline stations and other facilities.

❑ When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

❑ Toluene does not usually stay in the environment long.

❑ Toluene does not concentrate or buildup to high levels in animals.

How might I be exposed to toluene?

❑ Breathing contaminated workplace air or automobile exhaust.

❑ Working with gasoline, kerosene, heating oil, paints, and lacquers.

❑ Drinking contaminated well-water.

❑ Living near uncontrolled hazardous waste sites containing toluene products.

How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levles can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

How can toluene affect children?

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults.
Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

How can families reduce the risk of exposure to toluene?

❑ Use toluene-containing products in well-ventilated areas.

❑ When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

Is there a medical test to show whether I've been exposed to toluene?

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Toluene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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XYLENE

CAS # 1330-20-7

Agency for Toxic Substances and Disease Registry ToxFAQs September 1996

This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zī′lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

- Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- It evaporates quickly from the soil and surface water into the air.
- In the air, it is broken down by sunlight into other less harmful chemicals.
- It is broken down by microorganisms in soil and water.
- Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

- Breathing xylene in workplace air or in automobile exhaust.
- Breathing contaminated air.
- Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.
- Breathing cigarette smoke that has small amounts of xylene in it.
- Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.
- The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that xylene is not classifiable as to its carcinogenicity in humans.

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

Is there a medical test to show whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

The EPA requires that spills or accidental releases of xylenes into the environment of 1,000 pounds or more must be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for xylenes (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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ZINC

CAS # 7440-66-6

This fact sheet answers the most frequently asked health questions (FAQs) about zinc. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Zinc is a naturally occurring element. Exposure to high levels of zinc occurs mostly from eating food, drinking water, or breathing workplace air that is contaminated. Low levels of zinc are essential for maintaining good health. Exposure to large amounts of zinc can be harmful. It can cause stomach cramps, anemia, and changes in cholesterol levels. Zinc has been found in at least 985 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is zinc?

Zinc is one of the most common elements in the earth's crust. It is found in air, soil, and water, and is present in all foods. Pure zinc is a bluish-white shiny metal.

Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass, and bronze. A zinc and copper alloy is used to make pennies in the United States.

Zinc combines with other elements to form zinc compounds. Common zinc compounds found at hazardous waste sites include zinc chloride, zinc oxide, zinc sulfate, and zinc sulfide. Zinc compounds are widely used in industry to make paint, rubber, dyes, wood preservatives, and ointments.

What happens to zinc when it enters the environment?

- Some is released into the environment by natural processes, but most comes from human activities like mining, steel production, coal burning, and burning of waste.
- It attaches to soil, sediments, and dust particles in the air.
- Rain and snow remove zinc dust particles from the air.
- Depending on the type of soil, some zinc compounds can move into the groundwater and into lakes, streams, and rivers.
- Most of the zinc in soil stays bound to soil particles and does not dissolve in water.
- It builds up in fish and other organisms, but it does not build up in plants.

How might I be exposed to zinc?

- Ingesting small amounts present in your food and water.
- Drinking contaminated water or a beverage that has been stored in metal containers or flows through pipes that have been coated with zinc to resist rust.
- Eating too many dietary supplements that contain zinc.
- Working on any of the following jobs: construction, painting, automobile mechanics, mining, smelting, and welding; manufacture of brass, bronze, or other zinc-containing alloys; manufacture of galvanized metals; and manufacture of machine parts, rubber, paint, linoleum, oilcloths, batteries, some kind of glass, ceramics, and dyes.

How can zinc affect my health?

Zinc is an essential element in our diet. Too little zinc can cause problems, but too much zinc is also harmful.

Harmful effects generally begin at levels 10-15 times higher than the amount needed for good health. Large doses taken by mouth even for a short time can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia and decrease the levels of your good cholesterol. We do not know if high levels of zinc affect reproduction in humans. Rats that were fed large amounts of zinc became infertile.

Inhaling large amounts of zinc (as dusts or fumes) can cause a specific short-term disease called metal fume fever. We do not know the long-term effects of breathing high levels of zinc.

Putting low levels of zinc acetate and zinc chloride on the skin of rabbits, guinea pigs, and mice caused skin irritation. Skin irritation will probably occur in people.

How likely is zinc to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified zinc for carcinogenicity. Based on incomplete information from human and animal studies, the EPA has determined that zinc is not classifiable as to its human carcinogenicity.

How can zinc affect children?

Zinc is essential for proper growth and development of young children. It is likely that children exposed to very high levels of zinc will have similar effects as adults. We do not know whether children are more susceptible to the effects of excessive intake of zinc than the adults.

We do not know if excess zinc can cause developmental effects in humans. Animal studies have found decreased weight in the offspring of animals that ingested very high amounts of zinc.

How can families reduce the risks of exposure to zinc?

❏ Children living near waste sites that contain zinc may be exposed to higher levels of zinc through breathing contaminated air, drinking contaminated drinking water, touching or eating contaminated soil.
❏ Discourage your children from eating soil or putting their hands in their mouths and teach them to wash their hands frequently and before eating.
❏ If you use medicines or vitamin supplements containing zinc, make sure you use them appropriately and keep them out of the reach of children.

Is there a medical test to determine whether I've been exposed to zinc?

There are tests available to measure zinc in your blood, urine, hair, saliva, and feces. These tests are not usually done in the doctor's office because they require special equipment. High levels of zinc in the feces can mean high recent zinc exposure. High levels of zinc in the blood can mean high zinc consumption and/or high exposure. Tests to measure zinc in hair may provide information on long-term zinc exposure; however, the relationship between levels in your hair and the amount of zinc you were exposed to is not clear.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water should contain no more than 5 milligrams per liter of water (5 mg/L) because of taste. The EPA requires that any release of 1,000 pounds (or in some cases 5,000 pounds) into the environment be reported to the agency.

To protect workers, the Occupational Safety and Health Administration (OSHA) has set an average limit of 1 mg/m^3 for zinc chloride fumes and 5 mg/m^3 for zinc oxide (dusts and fumes) in workplace air during an 8-hour workday, 40-hour workweek.

Similarly, the National Institute for Occupational Safety and Health (NIOSH) has set the same standards for up to a 10-hour workday over a 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Zinc (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Appendix C:

Quality Assurance Project Plan

SESI
CONSULTING ENGINEERS

Geotechnical
Environmental
Site Civil

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Parsippany, NJ 07054
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Quality Assurance Project Plan
For

252 Third Avenue
NYSDEC BCP Site No. C231154
Block 876, Lots 25, 26, 29-32
New York, NY 10010

Prepared for:

Gramercy Owners LLC

April 2025

SESI Project No:
13542

Table of Contents

TABLES

LIST OF ACRONYMS

Acronym	Definition
AAS	Absorption Spectroscopy
ASP	Analytical Service Protocol
BCP	Brownfield Cleanup Program
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Accreditation Program
GC/MS	Gas Chromatography/Mass Spectrometry
HAS	Hollow-stem Auger
HDPE	High-Density Polyethylene
LDPE	Low-density Polyethylene
LFPS	Low Flow Purging Sampling
MDL	Method Detection Limit
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyls
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PPE	Personal Protective Equipment
PTFE	Polytetrafluoroethylene
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RI/IRMWP	Remedial Investigation/Interim Remedial Work Plan
SESI	SESI Consulting Engineers, Inc.
TIC	Tentatively Identified Compound
TCL	Target Compound List
VOC	Volatile Organic Compound
USEPA	United States Environmental Protection Agency

1.0 PROJECT DESCRIPTION

This document presents the Quality Assurance Project Plan (QAPP) for the Remedial Action Work Plan (RAWP) for the proposed development at the property located at 252 Third Avenue, New York, New York (the "Site"). The Site consists of six (6) contiguous parcels in the Gramercy Park section of New York City and that are identified on local tax maps as Block 876, Lots 25, 26, 29, 30, 31 and 32 and total approximately 0.323 acres. Each lot is improved with either commercial storefronts or residential apartment buildings.

The Site is currently located in the C1-9A zoning district. The Site is bound by E 21st Street and residential apartment to the north, Gramercy Park E and Gramercy Park to the west, residential apartments to the south, and 3rd Avenue east with commercial, residential and retail beyond.

SESI Consulting Engineers (SESI) prepared the RAWP for the property located at 252 Third Avenue, New York, New York, dated April 2025, which describes the remediation activities to be conducted at the Site, as part of the Site's planned remediation.

2.0 PROJECT ORGANIZATION

The RAWP activities will be conducted by SESI and their qualified subcontractors, on behalf of Lexington Avenue Developers LLC. The organization of SESI's key project management and field staff, and respective areas of responsibility, is presented below **(Table 2.1)** along with the names of subcontractors.

Table 2.1—SESI Personnel and Subcontractors

Role	Name	Telephone No.
Project Principal	Fuad Dahan, P.E., PhD	973-808-9050 x249
Project Manager (PM)	James Vander Vliet. PE	973-808-9050 x 304
Principal Engineer	Fuad Dahan, P.E., PhD	973-808-9050 x249
Field Team Leader	TBD	
Quality Assurance Officer	TBD	
Field Personnel	TBD	
Analytical Laboratory	TBD	
Data Validator	TBD	

2.1 PROJECT PRINCIPAL

Provides technical and administrative oversight and guidance throughout the project, assist in securing company resources, participate in technical review of deliverables, and attend key meetings as needed.

2.2 PRINCIPAL ENGINEEER

Provides technical guidance and review of reports, analytical data. Will have key involvement in screening and development of remedial alternatives.

2.3 PROJECT MANAGER

Responsible for maintaining the day-to-day schedule for completing the fieldwork and deliverables according to Brownfield Cleanup Program (BCP) requirements and client expectations.

2.4 REMEDIAL INVESTIGATION WORK PLAN PROJECT MANAGER

Responsible for coordinating and directing field efforts of SESI staff and subcontractors, and for maintaining that work is done according to QAPP specifications.

2.5 FIELD TEAM LEADER

Responsible for overseeing field work during the implementation of the RAWP, including observing subcontractors, maintaining field notes, and collecting samples of various environmental media.

2.6 QUALITY ASSURANCE OFFICER

Responsible for reviewing sampling procedures and certify that the data was collected and analyzed using the appropriate procedures.

3.0 QA/QC OBJECTIVES FOR MEASUREMENT OF DATA

In cases where NYSDOH ELAP Certification exists for a specific group or category of parameters, the laboratories performing analysis in connection with this project will have appropriate NYSDOH ELAP Certification. Analytical Service Protocol (ASP, June 2000) Category B deliverables are required for all samples.

Detection limits set by NYSDEC-ASP (June 2000) will be used for all sample analyses unless otherwise noted. If NYSDEC-ASP-dictated detection limits prove insufficient to assess project goals (i.e., comparison to drinking water standards or attainment of ARARs), then ASP Special Analytical Services (SAS) or other appropriate methods will be utilized.

The quality assurance/quality control objectives for all measurement data include completeness, representativeness, comparability, precision and accuracy.

3.1 COMPLETENESS

The analyses performed must be appropriate and inclusive. The parameters selected for analysis are chosen to meet the objectives of the study.

Completeness of the analyses will be assessed by comparing the number of parameters intended to be analyzed with the number of parameters successfully determined and validated. Data must meet QC acceptance criteria for 100 percent or more of requested determinations.

3.2 REPRESENTATIVENESS

Samples must be taken of the population and, where appropriate, the population will be characterized statistically to express the degree to which the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process, or environmental condition.

Non-dedicated sampling devices will be cleaned between sampling points by washing and rinsing with Alconox, followed by a thorough rinse with distilled water. Specific cleaning techniques are described in the Field Sampling Procedure. Two types of blank samples will accompany each sample set where Target Compound List (TCL) volatiles are to be analyzed (water matrix only). A trip blank, consisting of a 40 ml VOA vial of organic-free water prepared by the laboratory, will accompany each set of sample bottles from the laboratory to the field and back. This bottle will remain sealed throughout the shipment and sampling process. This blank will be analyzed for TCL volatile organic compounds (VOCs) along with the groundwater samples to ensure that contamination with TCL volatile compounds has not occurred during the bottle preparation, shipment and sampling phase of the project. In order to check for contaminant carryover when non-dedicated sampling equipment is used, a rinsate blank will be submitted to the laboratory. This blank will also be analyzed for TCL volatile organic compounds. The TCL compounds are identified in the United States Environmental Protection Agency (USEPA) Contract Laboratory Program dated 10/2016 or as periodically updated.

The analysis results obtained from the determination of identical parameters in field duplicate samples can be used to further assess the representativeness of the sample data.

3.3 COMPARABILITY

Consistency in the acquisition, preparation, handling and analysis of samples is necessary in order for the results to be compared where appropriate. Additionally, the results obtained from analyses of the samples will be compared with the results obtained in previous studies, if available.

To ensure the comparability of analytical results with those obtained in previous or future testing, all samples will be analyzed by NYSDEC-approved methods. The NYSDEC-ASP mandated holding times for various analyses will be strictly adhered to

3.4 PRECISION AND ACCURACY

The validity of the data produced will be assessed for precision and accuracy. Analytical methods which will be used include gas chromatography/mass spectrometry (GC/MS), gas chromatography, colorimetry, atomic spectroscopy, gravimetric and titrametric techniques. The following outlines the procedures for evaluating precision and accuracy, routine monitoring procedures, and corrective actions to maintain analytical quality control. All data evaluations will be consistent with NYSDEC-ASP procedures (June 2000). Data will be 100 percent compliant with NYSDEC-ASP requirements. Matrix spike and matrix spike duplicates will be collected to confirm accuracy and precision at a rate of one (1) per 20 soil and/or groundwater samples taken.

The number of duplicate, spiked and blank samples analyzed will be a minimum of one (1) duplicate for every 20 samples per each medium of groundwater and soil. The inclusion and frequency of analysis of field blanks will be on the order of one (1) per every 20 samples (soil). For the aqueous matrix field blanks will be collected at a frequency of one (1) per day. Samples to be analyzed for volatile organic compounds will be accompanied by a trip blank for each shipment and field blanks (water matrix) or field blanks (soil). An equipment blank for Per- and polyfluoroalkyl substances (PFAS) will be collected once per day per matrix, regardless of whether equipment being used is disposable, at a frequency of one (1) per 20 samples taken for both soil and groundwater.

Quality assurance audit samples will be prepared and submitted by the laboratory QA manager for each analytical procedure used. The degree of accuracy and the recovery of analyte to be expected for the analysis of QA samples and spiked samples is dependent upon the matrix, method of analysis, and compound or element being determined. The concentration of the analyte relative to the detection limit is also a major factor in determining the accuracy of the measurement. The lower end of the analytical range for most analyses is generally accepted to be five (5) times the detection limit. At or above this level, the determination and spike recoveries for metals in water samples will be expected to range from 75 to 125 percent. The recovery of organic surrogate compounds and matrix spiking compounds determined by GC/MS will be compared to the guidelines for recovery of individual compounds as established by the United States Environmental Protection Agency Contract Laboratory Program dated 7/85 or as periodically updated.

The quality of results obtained for inorganic ion and demand parameters will be assessed by comparison of QC data with laboratory control charts for each test.

4.0 SAMPLING PROCEDURES

4.1 SAMPLING PROGRAM

The sampling program for this project will include soil, groundwater and soil vapor. Soil samples will be collected from split spoon sampling or macrocore devices retrieved from soil borings. Groundwater samples will be collected from groundwater monitoring wells using low flow purging techniques. Soil vapor samples will be collected from vapor points screened in the vadose zone using Summa Canisters.

4.1.1 DRILLING/SAMPLING PROCEDURES

Soil and groundwater samples will be collected by means of a soil boring program. Soil borings shall be completed using the hollow stem auger drilling methods, direct push methods, or rotary drilling methods, whichever methods are determined to be best suited to site conditions by the SESI project manager and SESI field team leader.

Soil samples will be collected from soil borings and analyzed in accordance with the NYSDEC-approved Work Plan. Monitoring wells for groundwater sample collection will be installed in select completed soil borings. Either hollow stem auger (HSA) or direct push drilling methods may be utilized for monitoring well completion.

Soil samples shall be collected continuously during drilling so that a complete soil profile is examined and described by the SESI field geologist. The sampling method employed shall be ASTM D-1586/Split Barrel Sampling using a standard 2-foot long, 2-inch outside diameter split-spoon sampler with a 140-pound hammer, in cases where HSA methods are used. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labeled, stored on site (on ice in a cooler if necessary), and transmitted to the appropriate testing laboratory or storage facility. Chain-of-custody procedures will be practiced following Section 15, EPA-600/4-82-029, Handbook for Sampling and Sample Preservation of Water and Waste Waters.

A geologist or engineer will be on Site during the drilling operations to fully describe each soil sample, following the New York State Soil Description Procedure, and to retain representative portions of each sample.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts [i.e., the number of blows from a soil sampling drive weight (140 pounds)] required to drive the split-spoon sampler in 6-inch increments and installing monitoring wells to levels directed by the supervising geologist following specifications further outlined in this protocol.

4.1.2 MONITORING WELL COMPLETION

Monitoring wells will be constructed of 0.010-inch slot size PVC well screen and riser casing. Other materials utilized for completion will be washed silica sand (Q-Rock No. 4 or approved equivalent) bentonite grout, Portland cement, and a protective steel locking well casing and cap with locks. The depth of the wells will be determined based on the depth to water, type of contaminant and field conditions encountered.

The monitoring well installation method for wells installed within unconsolidated sediments shall be to place the screen and riser assembly into the casing once the screen interval has been selected. At that time, a washed silica sand pack will be placed around the well screen if required to prevent screen plugging. If a sand pack is not warranted, the auger string will be pulled back to allow the native aquifer material to collapse 2 to 3 feet above the top of the screen. Bentonite pellets will then be added to the annulus between the casing and the inside auger to insure proper sealing. Cement/bentonite grout will continue to be added during the extraction of the augers until the entire aquifer thickness has been sufficiently sealed off from horizontal and/or vertical flow above the screened interval. During placement of sand and bentonite pellets, frequent measurements will be made to check the height of the sand pack and thickness of bentonite layers by a weighted drop tape measure.

A bolt-down protective curb box will be installed, flush with the ground, or steel “stick-up” protective casing and secured by a Portland cement seal. The cement seal shall extend laterally at least 1 foot in all directions from the protective casing and shall slope gently away to drain water away from the well.

4.1.3 WELL DEVELOPMENT

All monitoring wells will be developed or cleared of all fine-grained materials and sediments that have settled in or around the well during installation so that the screen is transmitting representative portions of the groundwater. The development will be by one (1) of two (2) methods, pumping or bailing groundwater from the well until it yields relatively sediment-free water.

A decontaminated pump or bailer will be used and subsequently decontaminated after each use following procedures outlined in the Decontamination Protocol. Pumping or bailing will cease when the turbidity falls below 50 NTUs or until specific conductivity, pH, and temperature are stable (i.e., consecutive readings are within 10 percent with no overall upward or downward trends in measurements). Well development water will be disposed of on the ground surface at each well location.

4.1.4 DECONTAMINATION

All drilling equipment and associated tools including augers, drill rods, sampling equipment, wrenches and any other equipment or tools that have come in contact with contaminated materials will be decontaminated before any drilling on Site begins, between each well, and prior to removing any equipment from the Site. The preferred decontamination procedure will be to scrape the equipment from any residual soils and then rinse with water and Alconox®. Every effort will be made to minimize the generation of contaminated water. Any contaminated water generated will be drummed. The contaminated water drums will be disposed of at an appropriate facility after approval and sampling in accordance with the specific facility requirements.

4.1.5 PFAS SAMPLING CONSIDERATIONS

This section contains the materials limitations for Per- and polyfluoroalkyl substances sampling in accordance with the Draft NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (April 2023).

The groundwater samples will be analyzed for PFAS using USEPA Method 1633 (if samples are taken on or after July 15th, 2025, then EPA Method 1633A will be used for PFAS analysis). Reporting limits for PFOA and PFOS will not exceed 2 nanograms per liter (ng/L). Category B deliverables and an electronic data deliverable will be completed.

PFAS are very persistent in the environment and in the human body. Due to their presence in a variety of products, persistence in the environment and very low drinking water standards, care must be used when groundwater sampling for PFAS to avoid cross contamination from the sampling equipment and personal protective equipment (PPE).

No fabric softener will be used on clothing to be worn in field. Cosmetics, moisturizers, hand cream, unauthorized sunscreen, insect repellent or other related products will not be used the morning of sampling. The field samplers will wear powder-free nitrile gloves while filling and sealing the sample bottles. The sampling equipment components and sample containers will not come in contact with material that may potentially contain PFAS such as aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials will be avoided. Food and drink packaging materials will be avoided, as well.

Sampling will be performed using certified PFAS-free sampling materials such as stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate or polypropylene pump and tubing. Rinse water must be laboratory-provided certified PFAS-free distilled or de-ionized water. Standard two step decontamination using Alconox® detergent and clean certified PFAS-free water rinse will be performed for equipment that does come in contact with PFAS materials.

No waterproof field books, plastic clipboards, binders, or spiral hard cover will be used for PFAS containers. No adhesives (i.e. Post-It® Notes), sharpies, or permanent markers will be used for PFAS containers. The PFAS containers will be labeled with ballpoint pens. PFAS samples will be stored in separate cooler filled with regular ice only with no chemical (blue) ice packs.

Pre-cleaned sample bottles with closures, coolers, sample labels and a chain of custody form will be provided by the laboratory.

4.2 GROUNDWATER SAMPLING PROGRAM

4.2.1 WELL EVACUATION

Prior to sampling a monitoring well, the static water level will be recorded. All well data will be recorded on a field sampling record. The wells will be sampled in accordance with the USEPA guidelines for the Low Flow Purging Sampling (LFPS). The purpose of LFPS is to collect groundwater samples from monitoring wells that are representative of ambient groundwater conditions in the aquifer. The LFPS method reduces turbidity which is needed particularly when sampling for metals.

4.2.2 SAMPLING PROCEDURE

The wells will be sampled using the USEPA LFPS technique. A flow rate of 100 ml to 250 ml per minute is used to purge the wells. Drawdown should not exceed 0.3 feet. The pump intake is lowered to the mid-point of the water column or as subsurface features such as bedrock fractures or more permeable zones warrant. At the initiation of low flow purging a water level is recorded as well as field parameters. Field parameters are then monitored every five (5) minutes during low flow purging using a flow through cell. When three (3) consecutive measurements of pH differ by 0.1 units or less, with ORP within 10 mv or less, turbidity varies 10 percent or less, conductivity differs by 3 percent or less and dissolved oxygen by 10 percent or less, sampling may begin. Flow through cells are used so continuous real time readings are made. When the parameters stabilize the flow through cell is disconnected and sample bottles are filled directly from the tubing. Low-flow sampling procedures are summarized on **Table 4.1.**

4.3 SOIL VAPOR SAMPLING

Soil vapor sampling will be conducted in accordance with NYSDOH Guidance for Evaluating Soil Vapor Intrusion in New York State (October 2006 and the subsequent March 2024 updates to the Soil Vapor/Indoor Air Decision Matrices). Soil vapor samples will be collected in the vadose zone.. Each vapor point will be installed in a shallow boring drilled either by hand-operated equipment (e.g. hand auger or percussion hammer drill), or by a small truck-mounted drill rig. Drilling equipment used shall be based on soil conditions, and the method that provides the most practical approach.

Each vapor point will consist of an inert sampling tube (polyethylene, stainless steel, or Teflon®) with a six (6)-inch screened section at the bottom through which soil vapors can be sampled. The screen slot size will be 0.0075 inches. A sampling zone will be created around the screened section by backfilling with one (1) to two (2) feet of porous coarse sand or glass beads, and at least three (3) feet of bentonite will be placed above the porous sampling zone to form a seal from the surface. Native clean soil will be packed around the remaining annulus to the ground surface.

The regulator will be set to collect a soil vapor sample at a flow rate of less than 0.2 liters per minute. After the summa canister is filled, the valve will be closed.

Each canister will be listed according to a specific sample I.D. on a chain of custody form. Sample canisters will be delivered to the laboratory within 24 hours and analyzed for VOCs by method TO-15. The detection limit for VOCs will be 1 µg/m3 or less.

The soil vapor sampling effort will include the use of inert helium tracer gas to verify that the soil vapor samples are not diluted by ambient air. The atmosphere around the sampling tube will be enriched with the tracer gas, and the soil vapor sample will be collected in the presence of the enriched tracer atmosphere. This will be accomplished by placing an inverted plastic pail over the sampling point and filling the pail with the tracer gas via a small tube penetrating the site of the pail. Refer to NYSDOH Guidance for Evaluating Indoor Air Intrusion in New York State (October 2006).

Weather conditions in the 48 hours prior to the test, and during the test, will be noted, including average wind speed, precipitation, temperature, and barometric pressure.

4.4 SAMPLE PRESERVATION AND SHIPMENT

Since all bottles will contain the necessary preservatives as shown in **Table 4.2**, they need only be filled. The 40 ml VOA vials must be filled brim full with no air bubbles. The other bottles should be filled to within about one (1) inch from the top.

The bottles will be sent from the laboratory in coolers which will be organized on a per site basis. Following sample collection, the bottles should be placed on ice in the shipping cooler. The samples will be cooled to 4°C, but not frozen.

Final packing and shipment of coolers will be performed in accordance with guidelines outlined in the ASP.

5.0 SAMPLE CUSTODY

The program for sample custody and sample transfer is in compliance with the NYSDEC-ASP, as periodically updated. If samples may be needed for legal purposes, chain-of-custody procedures, as defined by NEIC Policies and Procedures (USEPA-330/9-78-001-R, Revised June 1988) will be used. Sample chain-of-custody is initiated by the laboratory with selection and preparation of the sample containers. To reduce the chance for error, the number of personnel handling the samples should be minimized.

5.1 FIELD SAMPLE CUSTODY

A chain-of-custody record accompanies the samples from initial sample container selection and preparation at the laboratory, shipment to the field for sample containment and preservation, and return to the laboratory. Two (2) copies of this record follow the samples to the laboratory. The laboratory maintains one (1) file copy and the completed original is returned to the site inspection team. Individual sample containers provided by the laboratory are used for shipping samples. The shipping containers are insulated and ice is used to maintain samples at approximately 4°C until samples are returned and in the custody of the laboratory. All sample bottles within each shipping container are individually labeled and controlled. Samples are to be shipped to the laboratory within 24 to 48 hours of the day of collection depending on parameter holding times.

Each sample shipping container is assigned a unique identification number by the laboratory. This number is recorded on the chain-of-custody record and is marked with indelible ink on the outside of the shipping container. The field sampler will indicate the sample designation/location number in the space provided on the appropriate chain-of-custody form for each sample collected. The shipping container is closed and a seal provided by the laboratory is affixed to the latch. This seal must be broken to open the container, and this indicates possible tampering if the seal is broken before receipt at the laboratory. The laboratory will contact the site investigation team leader and the sample will not be analyzed if tampering is apparent.

5.2 LABORATORY SAMPLE CUSTODY

The site investigation team leader or Project Quality Assurance Officer notifies the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The laboratory sample program meets the following criteria:

- The laboratory has designated a sample custodian who is responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian signs the chain-of-custody record and records the date and time received.
- Care is exercised to annotate any labeling or descriptive errors. In the event of discrepant documentation, the laboratory will immediately contact the site investigation team leader as part of the corrective action process. A qualitative assessment of each sample container is performed to note any anomalies, such as broken or leaking bottles.

This assessment is recorded as part of the incoming chain-of-custody procedure:

1. The samples are stored in a secured area at a temperature of approximately 4°C until analyses are to commence.
2. A laboratory chain-of-custody record accompanies the sample or sample fraction through final analysis for control.
3. A copy of the chain-of-custody form will accompany the laboratory report and will become a permanent part of the project records.

5.3 FINAL EVIDENCE FILES

Final evidence files include all originals of laboratory reports and are maintained under documented control in a secure area.

A sample or an evidence file is under custody if:

- It is in your possession; it is in your view, after being in your possession.
- It was in your possession and you placed it in a secure area.

- It is in a designated secure area.

6.0 CALIBRATION PROCEDURES

Instruments and equipment used to gather, generate or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the appropriate manufacturer's specifications or project specific requirements. The procedures for instrument calibration, calibration verification, and the frequency of calibrations are described in the ASP. The calibration of instruments used for the determination of metals will be as described in the appropriate CLP standard operating procedures.

Calibration of other instruments required for measurements associated with these analyses will be in accordance with the manufacturer's recommendations and the standard operating procedures of the laboratory.

7.0 ANALYTICAL PROCEDURES

Analytical procedures shall conform to the most recent revision of the NYSDEC-ASP (June 2005) and are summarized on **Table 7.1.** In the absence of USEPA or NYSDEC guidelines, appropriate procedures shall be submitted for approval by NYSDEC prior to use. Any deviations from the listed testing methods will be coordinated with NYSDEC.

The procedures for the sample preparation and analysis for organic compounds are as specified in the NYSDEC-ASP. Analytical cleanups are mandatory where matrix interferences are noted. No sample shall be diluted any more than a factor of five. The sample shall be either re-extracted, re-sonicated, re-stream distilled, etc. or be subjected to any one analytical cleanup noted in SW846 or a combination thereof. The analytical laboratory shall expend such effort and discretion to demonstrate good laboratory practice and demonstrate an attempt to best achieve the method detection limit.

7.1 VOLATILE ORGANICS

For the analysis of water samples for Target Compound List VOCs, no sample preparation is required. The analytical procedure for volatiles is detailed in NYSDEC-ASP (Volume I, Section D-I). A measured portion of the sample is placed in the purge and trap apparatus and the sample analysis is performed by gas chromatography/mass spectrometry for the first round. USEPA Method 8260 will be used, plus tentatively identified compounds (TICs). USEPA Methods 8010 or 8020 (gas chromatography with different detectors) will be used if subsequent rounds with lower limits of detection are warranted.

7.2 SEMI-VOLATILE ORGANIC COMPUNDS

The extraction and analytical procedures used for preparation of water, soil and sediment samples for the analysis of the TCL semi-volatile organic compounds are described in NYSDEC-ASP Volume I, Section D-III. USEPA Method 8270 will be used, plus TICs.

Instrument calibration, compound identification, and quantitation are performed as described in Section 6 of this document and in the NYSDEC-ASP.

7.3 PESTICIDE AND PCB COMPOUNDS

The sample preservation procedures for gas chromatography for pesticides and polychlorinated biphenyls (PCBs) will be as described in the NYSDEC-ASP methods (Section D-IV). The analysis of standard mixes, blanks and spiked samples will be performed at the prescribed frequency with adherence to the 72-hour requirement described in the method.

7.4 METALS

Water, soil and waste samples will be analyzed for the metals listed in Table 7.1. The detection limits for these metals are as specified in the NYSDEC-ASP, Section D-V. The instrument detection limits will be determined using calibration standards and procedures specified in the NYSDEC-ASP. The detection limits for individual samples may be higher due to the sample matrix. The procedures for these analyses will be as described in the NYSDEC-ASP.

The analyses for metals will be performed by atomic absorption spectroscopy (AAS) or inductively-coupled plasma emission spectroscopy (ICPES), as specified in the ASP with regard to AAS flame analysis.

7.5 PER- AND POLYFLUOROALKYL SUBSTANCES

The NYSDEC has developed a list of 40 PFAS Analytes List on Table 7.1 for remedial programs. These are:

- Perfluorobutanesulfonic acid
- Perfluoropentanesulfonic acid
- Perfluorohexanesulfonic acid
- Perfluoroheptanesulfonic acid
- Perfluorooctanesulfonic acid
- Perfluorononanesulfonic acid
- Perfluorodecanesulfonic acid
- Perfluorododecanesulfonic acid
- Perfluorobutanoic acid
- Perfluoropentanoic acid

- Perfluorohexanoic acid
- Perfluoroheptanoic acid
- Perfluorooctanoic acid
- Perfluorononanoic acid
- Perfluorodecanoic acid
- Perfluoroundecanoic acid
- Perfluorododecanoic acid
- Perfluorotridecanoic acid
- Perfluorotetradecanoic acid
- Perfluorohexadecanoic acid
- Hexafluoropropylene oxide dimer acid
- 4,8-Dioxa-3H-perfluorononanoic acid
- Perfluoro-3-methoxypropanoic acid
- Perfluoro-4-methoxybutanoic acid
- Nonafluoro-3,6-dioxaheptanoic acid
- 4:2 Fluorotelomer sulfonic acid
- 6:2 Fluorotelomer sulfonate
- 8:2 Fluorotelomer sulfonate
- 3:3 Fluorotelomer carboxylic acid
- 5:3 Fluorotelomer carboxylic acid
- 7:3 Fluorotelomer carboxylic acid
- Perflurorooctane sulfonamide
- N-methylperfluorooctane sulfonamide
- N-ethylperfluorooctane sulfonamide
- N-methyl perfluorooctanesulfonamidoacetic acid
- N-ethyl perfluorooctanesulfonamidoacetic acid
- N-methylperfluorooctane sulfonamidoethanol
- N-ethylperfluorooctane sulfonamidoethanol
- 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major)
- 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)
- Perfluoro(2-ethoxyethane) sulfonic acid

Currently, ELAP does not offer certification for PFAS compounds in matrices other than finished drinking water. Per the NYSDEC June 2019 memo on emergent contaminant sampling, the analytical procedure for soil and groundwater sampling of PFAS is Modified EPA Method 1633. The reporting limit for PFAS in soil samples is 0.5 ug/kg. Reporting limits for perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) in groundwater should not exceed 2 ng/L.

7.6 SITE SPECIFICITY OF ANALYSES

Work plans prepared for remedial actions for sites contain recommendations for the chemical parameters to be determined for each site. Thus, some or all of the referenced methods will apply to the analysis of samples collected at the individual waste sites. Analyses of TCL analytes will be performed on all samples.

To ensure that the field sampling and laboratory analytical practices are acceptable, the data associated with the samples will be validated by a third party (in accordance with requirements of DER-10). The validation approach and results will be presented in a data usability summary report (DUSR) to be included in the Report.

TABLES

TABLE 4.1--SAMPLING PROCEDURE FOR MONITORING WELLS USING LOW-STESS (LOW-FLOW) METHODS

Step	Description	Details
1	Record initial static water level.	**Device:** electric contact probe accurate to the nearest 0.1 foot.
2	Lower sampling device into well. Slowly lower the pump, safety cable, tubing and electrical lines into the well to the depth specified for that well.	Pump intake must be no less than 2 feet from the bottom of the well to prevent disturbance and resuspension of sediments which may be at the bottom of the well.
3	Measure water level again: Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.	
4	Purge Well	Start pumping the well at 200 to 500 milliliters per minute (ml/min). The water level should be monitored approximately every five minutes. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. As noted above, care should be taken to maintain pump suction and to avoid entrainment of air in the tubing.
5	Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.	
6	Monitor Indicator Parameters	1. During purging of the well, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, and DO) approximately every five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive

Step	Description	Details
		readings as follows (Puls and Barcelona, 1996): a. 0.1 for pH b. 3% for specific conductance (conductivity) c. 10 mv for redox potential d. 10% for DO and turbidity
7	The pump must not be removed from the well between purging and sampling.	Dissolved oxygen and turbidity usually require the longest time to achieve stabilization.
8	Collect Samples	Collect samples at a flow rate between 100 and 250 ml/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft. VOC samples must be collected first and directly into sample containers. All sample containers should be filled with minimal turbulence by allowing the ground water to flow from the tubing gently down the inside of the container.
9	Ground water samples to be analyzed for volatile organic compounds (VOCs) require pH adjustment. The appropriate EPA Program Guidance should be consulted to determine whether pH adjustment is necessary.	If pH adjustment is necessary for VOC sample preservation, the amount of acid to be added to each sample vial prior to sampling should be determined, drop by drop, on a separate and equal volume of water (e.g., 40 ml). Groundwater purged from the well prior to sampling can be used for this purpose.
10	Remove Pump and Tubing	After collection of the samples, the tubing, unless permanently installed, must be properly discarded or dedicated to the

Step	Description	Details
		well for resampling by hanging the tubing inside the well.
11	Measure and record well depth.	
12	Close and lock the well.	
13	Samples are capped, labeled and placed in laboratory coolers with ice packs or bagged ice.	
14	All equipment is cleaned with successive rinses of pesticide-grade methanol and distilled water.	Dedicated line is disposed of or left at well site.
15	Equipment/wash blanks are collected when non-dedicated sampling equipment is used.	
16	Chain-of-custody forms are completed in triplicate.	The original and one carbon copy are put into a zip-lock bag and placed into the cooler. The original will be returned following sample analysis. A second carbon copy is kept on file.
17	Cooler is sealed with strapping tape and chain-of-custody seals to assure integrity and to prevent tampering of sample.	

TABLE 4.2--SAMPLE CONTAINERIZATION

PARAMETER & ANALYTICAL METHOD	NO.	BOTTLE TYPE	PRESERVATIVE[1]	HOLDING TIME
Aqueous Samples				
VOCs – USEPA 8260C	3	40 mL, glass vial with septum cap	Hydrochloric Acid to pH <2 Ice to 4°C	14 days
SVOCs (BNAs) and 1,4-Dioxane – USEPA 8270 SIM	2	1-liter amber glass bottle	Ice to 4°C	7 days (until extraction) 40 days (extracted)
Pesticides – USEPA 8081B	2	1-liter amber glass bottle	Ice to 4°C	7 days (until extraction) 40 days (extracted)
PCBs – USEPA 8082A	2	1-liter amber glass bottle	Ice to 4°C	7 days (until extraction) 40 days (extracted)
Metals[2]	1	1-liter, plastic bottle	Nitric acid to pH <2 NaOH for cyanide Ice to 4°C	180 days Cyanide: 14 days Mercury: 28 days
Cyanide – USEPA 9010C/9012B	1	1-liter, plastic	Sodium Hydroxide to pH >12 Ice to 4°C	14 days
PFAS Compounds – USEPA Modified Method 1633 (if samples are taken on or after July 15th, 2025, then EPA Method 1633A will be used for PFAS analysis).	2	500 ml HDPE or Polypropylene with non-Teflon lid	None	14 days
Soil, Sediment, Solid Waste Samples:				
VOCs – USEPA 8260C	3	5-gram EnCore samplers	Chilled to 0 - 6°C	14 days

PARAMETER & ANALYTICAL METHOD	NO.	BOTTLE TYPE	PRESERVATIVE(1)	HOLDING TIME
SVOCs (BNAs) and 1,4-Dioxane – USEPA 8270D SIM if RL cannot be reached	1	4-oz. glass jar with Teflon lid	Chilled to 0 - 6°C	14 days (until extraction, 40 days extracted)
Pesticides – USEPA 8081B	1	4-oz. glass jar with Teflon lid	Chilled to 0 - 6°C	14 days (until extraction) 40 days (extracted)
PCBs – USEPA 8082A	1	4-oz. glass jar with Teflon lid	Chilled to 0 - 6°C	None
Metals(3)	1	4-oz. glass jar with Teflon lid	Chilled to 0 - 6°C	180 days Cyanide: 14 days Mercury: 28 days
PFAS Compounds – USEPA Modified Method 1633	2	500 ml HDPE or Polypropylene with non-Teflon lid	None	28 days
Soil Vapor / Indoor Air Samples:				
VOCs – USEPA TO-15	1	Summa Canister	None	30 days

(1) All samples will be preserved with ice during collection and shipment.

(2) Metals refers to the 24 metals and cyanide in the Target Compound List (NYSDEC-CLP 11/87). Metals will be analyzed by Method 6020B, 7470A for mercury, and 9010C/9012B for cyanide

(3) A complete list of compounds is provided on Table 7.1.

(4) Any samples taken on or after July 15th, 2025 for PFAS analysis will be analyzed using EPA Method 1633A.

(5) Any deviations from the listed testing methods will be coordinated with NYSDEC.

TABLE 7.1–CONTRACT-REQUIRED QUANTITATION LEVELS AND ANALYTICAL METHODS FOR ASP INORGANICS, ASP VOLATILES, ASP SEMI-VOLATILES, ASP PESTICIDES, PCBs, AND PFAS

Target Analyte List (TAL) and Contract-Required Quantitation Limit

SECTION 1 - ASP INORGANICS Method: NYSDEC-ASP-91-4					
METALS		CONTRACT-REQUIRED DETECTION LEVEL* (µg/L)	METALS		CONTRACT-REQUIRED DETECTION LEVEL* (µg/L)
1.	Aluminum	200	13.	Magnesium	5,000
2.	Antimony	60	14.	Manganese	15
3.	Arsenic	15	15.	Mercury	0.2
4.	Barium	200	16.	Nickel	40
5.	Beryllium	5	17.	Potassium	5,000
6.	Cadmium	5	18.	Selenium	35
7.	Calcium	5,000	19.	Silver	10
8.	Chromium	10	20.	Sodium	5,000
9.	Cobalt	50	21.	Thallium	25
10.	Copper	25	22.	Vanadium	50
11.	Iron	100	23.	Zinc	60
12.	Lead	10	24.	Cyanide	10

Target Compound List (TCL) and Contract-Required Quantitation Limit

SECTION 2 – ASP ORGANICS (VOLATILES) Method: NYSDEC-ASP-91-1					
VOLATILE		CONTRACT-REQUIRED QUANTITATION LIMIT** (µg/L)	VOLATILE		CONTRACT-REQUIRED QUANTITATION LIMIT** (µg/L)
1.	Chloromethane	5.0	18.	1,2-Dichloropropane	5.0

SECTION 2 – ASP ORGANICS (VOLATILES) Method: NYSDEC-ASP-91-1			
VOLATILE	**CONTRACT-REQUIRED QUANTITATION LIMIT** (µg/L)**	**VOLATILE**	**CONTRACT-REQUIRED QUANTITATION LIMIT** (µg/L)**
2. Bromomethane	5.0	19. cis-1,3-Dichloropropene	5.0
3. Vinyl Chloride	5.0	20. Trichloroethene	5.0
4. Chloroethane	5.0	21. Dibromochloromethane	5.0
5. Methylene Chloride	5.0	22. 1,1,2-Trichloroethane	5.0
6. Acetone	10.0	23. Benzene	5.0
7. Carbon Disulfide	5.0	24. Trans-1.3-Dichloropropene	5.0
8. 1,1-Dichloroethylene	5.0	25. Bromoform	5.0
9. 1,1-Dichloroethane	5.0	26. 2-Hexanone	10.0
10. 1,2-Dichloroethylene (total)	5.0	27. 4-Methyl, 1,2-Pentanone	10.0
11. Chloroform	5.0	28. Tetrachloroethylene	5.0
12. 1,2-Dichloroethane	5.0	29. Toluene	5.0
13. 2-Butanone	10.0	30. Chlorobenzene	5.0
14. 1,1,1-Trichloroethane	5.0	31. Ethylbenzene	5.0
15. Carbon Tetrachloride	5.0	32. Styrene	5.0
16. Bromodichloromethane	5.0	33. Total Xylenes	5.0
17. 1,1,2,2-Tetrachloroethane	5.0		

SECTION 3 - ASP ORGANICS (SEMI-VOLATILES) Method: NYSDEC-ASP-91-2					
	SEMI-VOLATILE	CONTRACT-REQUIRED QUANTITATION LIMIT (µg/l)		SEMI-VOLATILE	CONTRACT-REQUIRED QUANTITATION LIMIT (µg/l)
1.	Phenol	5.0	33.	Acenaphthene	5.0
2.	Bis(2-chloroethyl)ether	5.0	34.	2,4-Dinitrophenol	10.0
3.	2-Chlorophenol	5.0	35.	4-Nitrophenol	10.0
4.	1,3-Dichlorobenzene	5.0	36.	Dibenzofuran	5.0
5.	1,4-Dichlorobenzene	5.0	37.	Dinitrotoluene	5.0
6.	1,2-Dichlorobenzene	5.0	38.	Diethylphthalate	5.0
7.	2-Methylphenol	5.0	39.	4-Chlorophenyl phenyl ether	5.0
8.	2,2'oxybis(1-Chloropropane)	5.0	40.	Fluorene	5.0
9.	4-Methylphenol	5.0	41.	4-Nitroanile	10.0
10.	N-Nitroso-dipropylamine	5.0	42.	4,6-Dinitro-2-methylphenol	10.0
11.	Hexachloroethane	5.0	43.	N-nitrosodiphenyl amine	5.0
12.	Nitrobenzene	5.0	44.	4-Bromophenyl phenyl ether	5.0
13.	Isophorone	5.0	45.	Hexachlorobenzene	5.0
14.	2-Nitrophenol	5.0	46.	Pentachlorophenol	10.0
15.	2,4-Dimethylphenol	5.0	47.	Phenanthrene	5.0
16.	Bis(2-Chloroethoxy) methane	5.0	48.	Anthracene	5.0
17.	2,4-Dichlorophenol	5.0	49.	Carbazole	5.0
18.	1,2,4-Trichlorobenzene	5.0	50.	Di-n-butyl phthalate	5.0
19.	Naphthalene	5.0	51.	Fluoranthene	5.0
20.	4-Chloroaniline	5.0	52.	Pyrene	5.0
21.	Hexachlorobutadiene	5.0	53.	Butyl benzyl phthalate	5.0

SECTION 3 - ASP ORGANICS (SEMI-VOLATILES) Method: NYSDEC-ASP-91-2			
SEMI-VOLATILE	**CONTRACT-REQUIRED QUANTITATION LIMIT (µg/l)**	**SEMI-VOLATILE**	**CONTRACT-REQUIRED QUANTITATION LIMIT (µg/l)**
22. 4-Chloro-3-methylphenol	5.0	54. 3,3'-Dichloro benzidine	5.0
23. 2-Methylnaphthalene	5.0	55. Benz(a)anthracene	5.0
24. Hexachlorocyclopentadiene	5.0	56. Chrysene	5.0
25. 2,4,6-Trichlorophenol	5.0	57. Bis(2-ethylhexyl) phthalate	5.0
26. 2,4,5-Trichlorophenol	10.0	58. Di-n-octyl phthalate	5.0
27. 2-Chloronapthalene	5.0	59. Benzo(b)fluoranthene	5.0
28. 2-Nitroananiline	10.0	60. Benzo(k)fluoranthene	5.0
29. Dimethyl phthalate	5.0	61. Benzo(a)pyrene	5.0
30. Acenaphthylene	5.0	62. Indeno(1,2,3-cd) pyrene	5.0
31. 2,6-Dinitrotoluene	5.0	63. Dibenz(a,h) anthracene	5.0
32. 3-Nitroaniline	10.0	64. Benzo(g,h,i)perylene	5.0

SECTION 3 - ASP ORGANICS (PESTICIDES/PCBS) Method: NYSDEC-ASP-91-3			
PESTICIDE/PCB	**CONTRACT-REQUIRED QUANTITATION LIMIT (µg/l)**	**PESTICIDE/PCB**	**CONTRACT-REQUIRED QUANTITATION LIMIT (µg/l)**
1. Alpha-BHC	0.05	15. 4,4'-DDT	0.10
2. Beta-BHC	0.05	16. Methoxychlor	0.5
3. Delta-BHC	0.05	17. Endrin ketone	0.10
4. Gamma-BHC (lindane)	0.05	18. Endrin aldehyde	0.10
5. Heptachlor	0.05	19. Alpha-Chlordane	0.05
6. Aldrin	0.05	20. Gamma-Chlordane	0.05
7. Heptachlor epoxide	0.05	21. Toxaphene	5.0
8. Endosulfan I	0.05	22. AROCHLOR-1016	1.0
9. Dieldrin	0.10	23. AROCHLOR-1221	1.0
10. 4,4'-DDE	0.10	24. AROCHLOR-1232	1.0
11. Endrin	0.10	25. AROCHLOR-1242	1.0
12. Endosulfan II	0.10	26. AROCHLOR-1248	1.0
13. 4,4'-DDD	0.10	27. AROCHLOR-1254	1.0
14. Endosulfan sulfate	0.10	28. AROCHLOR-1260	1.0

*Matrix: groundwater. For soil matrix, multiply CRDL by 100.

**Quantitation limit for medium-level soil is 1,200 µg/kg (wet weight basis).

PFAS Compound List and Reporting and Method Detection Limits for Soil and Groundwater

Method: EPA 1633 by LC-MS/MS			
	PFAS	**Reporting Limit — Groundwater (ng/l)**	**Method Detection Limit — Groundwater (ng/l)**
1	Perfluorobutanesulfonic acid (PFBS)	1.6	0.245
2	Perfluoropentanesulfonic acid (PFPeS)	1.6	0.204
3	Perfluorohexanesulfonic acid (PFHxS)	1.6	0.217
4	Perfluoroheptanesulfonic acid (PFHpS)	1.6	0.137
5	Perfluorooctanesulfonic acid (PFOS)	1.6	0.327
6	Perfluorononanesulfonic acid (PFNS)	1.6	0.303
7	Perfluorodecanesulfonic acid (PFDS)	1.6	0.334
8	Perfluorododecanesulfonic acid (PFDoS)	1.6	0.179
9	Perfluorobutanoic acid (PFBA)	6.4	0.330
10	Perfluoropentanoic acid (PFPeA)	3.2	0.196
11	Perfluorohexanoic acid (PFHxA)	1.6	0.318
12	Perfluoroheptanoic acid (PFHpA)	1.6	0.221
13	Perfluorooctanoic acid (PFOA)	1.6	0.302
14	Perfluorononanoic acid (PFNA)	1.6	0.221
15	Perfluorodecanoic acid (PFDA)	1.6	0.333
16	Perfluoroundecanoic acid (PFUnA)	1.6	0.264
17	Perfluorododecanoic acid (PFDoA)	1.6	0.379
18	Perfluorotridecanoic acid (PFTrDA)	1.6	0.238
19	Perfluorotetradecanoic acid (PFTeDA)	1.6	0.264
20	Hexafluoropropylene oxide dimer acid (HFPO-DA)	6.4	0.406

Method: EPA 1633 **by LC-MS/MS**			
21	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	6.4	0.779
22	Perfluoro-3-methoxypropanoic acid (PFMPA)	3.2	0.177
23	Perfluoro-4-methoxybutanoic acid (PFMBA)	3.2	0.117
24	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	3.2	1.384
25	4:2 Fluorotelomer sulfonic acid (4:2-FTS)	6.4	2.281
26	6:2 Fluorotelomer sulfonic acid (6:2-FTS)	6.4	3.973
27	8:2 Fluorotelomer sulfonic acid (8:2-FTS)	6.4	1.566
28	3:3 Fluorotelomer carboxylic acid (3:3 FTCA)	8.0	0.721
29	5:3 Fluorotelomer carboxylic acid (5:3 FTCA)	40	5.066
30	7:3 Fluorotelomer carboxylic acid (7:3 FTCA)	40	5.942
31	Perfluorooctane sulfonamide (PFOSA)	1.6	0.227
32	N-methylperfluorooctane sulfonamide (NMeFOSA)	1.6	0.196
33	N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.6	0.585
34	N-methylperfluorooctane sulfonamidoacetic acid (N-MeFOSAA)	1.6	0.586
35	N-ethylperfluorooctane sulfonamidoacetic acid (N-EtFOSAA)	1.6	0.324
36	N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	16	1.191
37	N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	16	1.022
38	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major) (9CL-PF3ONS)	6.4	0.871
39	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor) (11CL-PF3OUDS)	6.4	0.819
40	Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA)	3.2	0.137
41	Perfluorohexadecanoic acid (PFHxDA)[1]	~	~
	1,4-dioxane		

Method: EPA 1633
by LC-MS/MS

	PFAS	**Reporting Limit — Soil (ng/g)**	**Method Detection Limit — Soil (ng/g)**
1	Perfluorobutanesulfonic acid (PFBS)	0.2	0.014
2	Perfluoropentanesulfonic acid (PFPeS)	0.2	0.015
3	Perfluorohexanesulfonic acid (PFHxS)	0.2	0.018
4	Perfluoroheptanesulfonic acid (PFHpS)	0.2	0.057
5	Perfluorooctanesulfonic acid (PFOS)	0.2	0.067
6	Perfluorononanesulfonic acid (PFNS)	0.2	0.046
7	Perfluorodecanesulfonic acid (PFDS)	0.2	0.040
8	Perfluorododecanesulfonic acid (PFDoS)	0.2	0.038
9	Perfluorobutanoic acid (PFBA)	0.8	0.401
10	Perfluoropentanoic acid (PFPeA)	0.4	0.021
11	Perfluorohexanoic acid (PFHxA)	0.2	0.020
12	Perfluoroheptanoic acid (PFHpA)	0.2	0.029
13	Perfluorooctanoic acid (PFOA)	0.2	0.037
14	Perfluorononanoic acid (PFNA)	0.2	0.086
15	Perfluorodecanoic acid (PFDA)	0.2	0.031
16	Perfluoroundecanoic acid (PFUnA)	0.2	0.033
17	Perfluorododecanoic acid (PFDoA)	0.2	0.059
18	Perfluorotridecanoic acid (PFTrDA)	0.2	0.038
19	Perfluorotetradecanoic acid (PFTeDA)	0.2	0.032
20	Hexafluoropropylene oxide dimer acid (HFPO-DA)	0.8	0.136
21	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	0.8	0.057
22	Perfluoro-3-methoxypropanoic acid (PFMPA)	0.4	0.033

Method: EPA 1633 by LC-MS/MS			
23	Perfluoro-4-methoxybutanoic acid (PFMBA)	0.4	0.029
24	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.4	0.084
25	4:2 Fluorotelomer sulfonic acid (4:2-FTS)	0.8	0.282
26	6:2 Fluorotelomer sulfonic acid (6:2-FTS)	0.8	0.116
27	8:2 Fluorotelomer sulfonic acid (8:2-FTS)	0.8	0.225
28	3:3 Fluorotelomer carboxylic acid (3:3 FTCA)	1.0	0.060
29	5:3 Fluorotelomer carboxylic acid (5:3 FTCA)	5.0	0.363
30	7:3 Fluorotelomer carboxylic acid (7:3 FTCA)	5.0	0.308
31	Perfluorooctane sulfonamide (PFOSA)	0.2	0.068
32	N-methylperfluorooctane sulfonamide (NMeFOSA)	0.2	0.049
33	N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.2	0.038
34	N-methylperfluorooctane sulfonamidoacetic acid (N-MeFOSAA)	0.2	0.030
35	N-ethylperfluorooctane sulfonamidoacetic acid (N-EtFOSAA)	0.2	0.044
36	N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	2.0	0.203
37	N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	2.0	0.247
38	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major) (9CL-PF3ONS)	0.8	0.038
39	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor) (11CL-PF3OUdS)	0.8	0.071
40	Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA)	0.4	0.018
41	Perfluorohexadecanoic acid (PFHxDA)[1]	~	~

Source: EPA Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS, April 2023

Data for this table are derived from the single-laboratory validation study and are only provided as examples for this draft method. The data will be updated to reflect the interlaboratory study results in a subsequent revision. Therefore, these criteria will change after interlaboratory validation.

[1] This compound was not listed in the EPA Method 1633 2nd draft and currently no known values exist

Appendix D:

Community Air Monitoring Plan

SESI
CONSULTING ENGINEERS

Geotechnical
Environmental
Site Civil

959 Route 46E, Fl 3, Ste 300
Parsippany, NJ 07054
973.808.9050
www.sesi.org

Community Air Monitoring Plan

For:

Proposed Mixed-Use Development

252 Third Avenue
New York, New York 10010
(BCP# C231154)

Prepared for:

252 Gramercy Owner, LLC

SESI Project No:
13542

Date:
April 2025

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LIST OF ACRONYMS

Acronym	Definition
CAMP	Community Air Monitoring Plan
mcg/m^3	micrograms per cubic meter
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PID	Photoionization Detector
PM-10	Less than 10 micrometers
ppm	Parts Per Million
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This document presents a Community Air Monitoring Plan (CAMP) for the remedial action at the proposed development at 252 3rd Avenue, New York, New York, 10010 (the “Site”). The Site consists of six (6) contiguous parcels identified on local tax maps as Block 876 Lots 25, 26, and 29 – 32, and totals approximately 0.32 acres in size. Lots 25 and 26 are improved with residential buildings, and Lots 29 – 32 are improved with residential and commercial use buildings. According to the Phase I Environmental Site Assessment, 37 Gramercy Park East and 38 Gramercy Park North, New York, New York, prepared by SESI Consulting Engineers, dated June 2024, and the Phase 1 Environmental Site Assessment, 252-258 3rd Avenue, New York, New York, prepared by EBI Consulting, dated February 16, 2022, the Site has been improved with residential apartment and mixed-use residential and commercial buildings since at least 1903.

The Site is bounded to the north by a mixed-use building with first floor retail and upper floors of residential apartments, to the east by Third Avenue, to the south by residential apartments and mixed-use residential and commercial buildings, and to the west by Gramercy Park East and Gramercy Park. The nearest surface water body is the East River located approximately 0.57 miles east of the Site.

2.0 OBJECTIVES

The objective of the CAMP is to provide a measure of protection for the downwind community from potential airborne contaminant releases that may arise during all ground intrusive activities, and potentially contaminated soil and material handling and staging. In addition, the CAMP is intended to ensure that dust and contaminants are not leaving the work zone**.**

3.0 METHODS

The CAMP will include continuous monitoring for particulate matter (e.g. airborne "dust") and volatile organic compounds (VOCs) during the planned remedial investigation, demolition, and construction activities. Any CAMP exceedances will be reported to the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) on the business day after site work takes place. Notification of the exceedance will be sent via email along with the reason for the exceedance, the measure(s) taken to address the exceedance, and if the exceedance was resolved.

TABLE 3.1 NYSDEC AND NYSDOH CONTACT INFORMATION

Name	**Contact Information**
Shawn T. Roberts NYSDEC	shawn.roberts@dec.ny.gov 518.402.9799
Christopher Budd NYSDOH	christopher.budd@health.ny.gov

3.1. CONTINUOUS MONITORING

Continuous monitoring for particulates and VOCs will be conducted during all ground intrusive activities including soil borings, monitoring well installations, soil excavation and loading, and demolition of the buildings.

3.2. PERIODIC MONITORING

Periodic monitoring for VOCs will be conducted 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 consists 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.

4.0 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

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. The monitoring work will be performed using a photoionization detector (PID) equipped with a 10.6 eV lamp. The equipment will be fresh air calibrated at least daily, and as specified by the manufacturer 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.

- 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.
- 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.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shut down.
- All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

5.0 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.

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

All readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review.

6.0 SPECIAL REQUIREMENTS FOR WORK WITHIN 20 FEET OF POTENTIALLY EXPOSED INDIVIDUAL STRUCTURES

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed one (1) ppm, monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.
- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m^3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m^3 or less at the monitoring point.
- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Attachment 1A:

NYSDOH Generic CAMP

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 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Attachment 1B:

Fugitive Dust and Particulate Monitoring

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^{o} C (14 to 122^{o} 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 E:

NYSDEC Soil Cleanup Objectives

375-6.8 Soil cleanup objective tables.

(a) Unrestricted use soil cleanup objectives.

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
Metals		
Arsenic	7440-38-2	13 [c]
Barium	7440-39-3	350 [c]
Beryllium	7440-41-7	7.2
Cadmium	7440-43-9	2.5 [c]
Chromium, hexavalent [e]	18540-29-9	1[b]
Chromium, trivalent [e]	16065-83-1	30 [c]
Copper	7440-50-8	50
Total Cyanide [e, f]		27
Lead	7439-92-1	63 [c]
Manganese	7439-96-5	1600 [c]
Total Mercury		0.18 [c]
Nickel	7440-02-0	30
Selenium	7782-49-2	3.9[c]
Silver	7440-22-4	2
Zinc	7440-66-6	109 [c]
PCBs/Pesticides		
2,4,5-TP Acid (Silvex) [f]	93-72-1	3.8
4,4'-DDE	72-55-9	0.0033 [b]
4,4'-DDT	50-29-3	0.0033 [b]
4,4'-DDD	72-54-8	0.0033 [b]
Aldrin	309-00-2	0.005 [c]
alpha-BHC	319-84-6	0.02
beta-BHC	319-85-7	0.036
Chlordane (alpha)	5103-71-9	0.094

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
delta-BHC [g]	319-86-8	0.04
Dibenzofuran [f]	132-64-9	7
Dieldrin	60-57-1	0.005 [c]
Endosulfan I [d, f]	959-98-8	2.4
Endosulfan II [d, f]	33213-65-9	2.4
Endosulfan sulfate [d, f]	1031-07-8	2.4
Endrin	72-20-8	0.014
Heptachlor	76-44-8	0.042
Lindane	58-89-9	0.1
Polychlorinated biphenyls	1336-36-3	0.1
Semivolatile organic compounds		
Acenaphthene	83-32-9	20
Acenapthylene [f]	208-96-8	100 [a]
Anthracene [f]	120-12-7	100 [a]
Benz(a)anthracene [f]	56-55-3	1[c]
Benzo(a)pyrene	50-32-8	1[c]
Benzo(b)fluoranthene [f]	205-99-2	1[c]
Benzo(g,h,i)perylene [f]	191-24-2	100
Benzo(k)fluoranthene [f]	207-08-9	0.8 [c]
Chrysene [f]	218-01-9	1[c]
Dibenz(a,h)anthracene [f]	53-70-3	0.33 [b]
Fluoranthene [f]	206-44-0	100 [a]
Fluorene	86-73-7	30
Indeno(1,2,3-cd)pyrene [f]	193-39-5	0.5 [c]
m-Cresol [f]	108-39-4	0.33 [b]
Naphthalene [f]	91-20-3	12
o-Cresol [f]	95-48-7	0.33 [b]

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
p-Cresol [f]	106-44-5	0.33 [b]
Pentachlorophenol	87-86-5	0.8 [b]
Phenanthrene [f]	85-01-8	100
Phenol	108-95-2	0.33 [b]
Pyrene [f]	129-00-0	100
Volatile organic compounds		
1,1,1-Trichloroethane [f]	71-55-6	0.68
1,1-Dichloroethane [f]	75-34-3	0.27
1,1-Dichloroethene [f]	75-35-4	0.33
1,2-Dichlorobenzene [f]	95-50-1	1.1
1,2-Dichloroethane	107-06-2	0.02 [c]
cis -1,2-Dichloroethene [f]	156-59-2	0.25
trans-1,2-Dichloroethene [f]	156-60-5	0.19
1,3-Dichlorobenzene [f]	541-73-1	2.4
1,4-Dichlorobenzene	106-46-7	1.8
1,4-Dioxane	123-91-1	0.1 [b]
Acetone	67-64-1	0.05
Benzene	71-43-2	0.06
n-Butylbenzene [f]	104-51-8	12
Carbon tetrachloride [f]	56-23-5	0.76
Chlorobenzene	108-90-7	1.1
Chloroform	67-66-3	0.37
Ethylbenzene [f]	100-41-4	1
Hexachlorobenzene [f]	118-74-1	0.33[b]
Methyl ethyl ketone	78-93-3	0.12
Methyl tert-butyl ether [f]	1634-04-4	0.93
Methylene chloride	75-09-2	0.05

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
n - Propylbenzene [f]	103-65-1	3.9
sec-Butylbenzene [f]	135-98-8	11
tert-Butylbenzene [f]	98-06-6	5.9
Tetrachloroethene	127-18-4	1.3
Toluene	108-88-3	0.7
Trichloroethene	79-01-6	0.47
1,2,4-Trimethylbenzene [f]	95-63-6	3.6
1,3,5-Trimethylbenzene[f]	108-67-8	8.4
Vinyl chloride[f]	75-01-4	0.02
Xylene (mixed)	1330-20-7	0.26

All soil cleanup objectives (SCOs) are in parts per million (ppm).

Footnotes

[a] The SCOs for unrestricted use were capped at a maximum value of 100 ppm. See Technical Support Document (TSD), section 9.3.

[b] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the Track 1 SCO value.

[c] For constituents where the calculated SCO was lower than the rural soil background concentration, as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site.

[d] SCO is the sum of endosulfan I, endosulfan II and endosulfan sulfate.

[e] The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

[f] Protection of ecological resources SCOs were not developed for contaminants identified in Table 375-6.8(b) with “NS”. Where such contaminants appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources SCO according to the TSD.

(b) Restricted use soil cleanup objectives.

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Metals							
Arsenic	7440-38-2	16[f]	16[f]	16[f]	16[f]	13[f]	16[f]
Barium	7440-39-3	350[f]	400	400	10,000[d]	433	820
Beryllium	7440-41-7	14	72	590	2,700	10	47
Cadmium	7440-43-9	2.5[f]	4.3	9.3	60	4	7.5
Chromium, hexavalent[h]	18540-29-9	22	110	400	800	1[e]	19
Chromium, trivalent[h]	16065-83-1	36	180	1,500	6,800	41	NS
Copper	7440-50-8	270	270	270	10,000[d]	50	1,720
Total Cyanide[h]		27	27	27	10,000[d]	NS	40
Lead	7439-92-1	400	400	1,000	3,900	63[f]	450
Manganese	7439-96-5	2,000[f]	2,000[f]	10,000[d]	10,000[d]	1600[f]	2,000[f]
Total Mercury		0.81[j]	0.81[j]	2.8[j]	5.7[j]	0.18[f]	0.73
Nickel	7440-02-0	140	310	310	10,000[d]	30	130
Selenium	7782-49-2	36	180	1,500	6,800	3.9[f]	4[f]
Silver	7440-22-4	36	180	1,500	6,800	2	8.3
Zinc	7440-66-6	2200	10,000[d]	10,000[d]	10,000[d]	109[f]	2,480
PCBs/Pesticides							
2,4,5-TP Acid (Silvex)	93-72-1	58	100[a]	500[b]	1,000[c]	NS	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033[e]	17
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033[e]	136
4,4'- DDD	72-54-8	2.6	13	92	180	0.0033[e]	14
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04[g]	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09
Chlordane (alpha)	5103-71-9	0.91	4.2	24	47	1.3	2.9

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
delta-BHC	319-86-8	100[a]	100[a]	500[b]	1,000[c]	0.04[g]	0.25
Dibenzofuran	132-64-9	14	59	350	1,000[c]	NS	210
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1
Endosulfan I	959-98-8	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan II	33213-65-9	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan sulfate	1031-07-8	4.8[i]	24[i]	200[i]	920[i]	NS	1,000[c]
Endrin	72-20-8	2.2	11	89	410	0.014	0.06
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1
Polychlorinated biphenyls	1336-36-3	1	1	1	25	1	3.2
Semivolatiles							
Acenaphthene	83-32-9	100[a]	100[a]	500[b]	1,000[c]	20	98
Acenapthylene	208-96-8	100[a]	100[a]	500[b]	1,000[c]	NS	107
Anthracene	120-12-7	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benz(a)anthracene	56-55-3	1[f]	1[f]	5.6	11	NS	1[f]
Benzo(a)pyrene	50-32-8	1[f]	1[f]	1[f]	1.1	2.6	22
Benzo(b)fluoranthene	205-99-2	1[f]	1[f]	5.6	11	NS	1.7
Benzo(g,h,i)perylene	191-24-2	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benzo(k)fluoranthene	207-08-9	1	3.9	56	110	NS	1.7
Chrysene	218-01-9	1[f]	3.9	56	110	NS	1[f]
Dibenz(a,h)anthracene	53-70-3	0.33[e]	0.33[e]	0.56	1.1	NS	1,000[c]
Fluoranthene	206-44-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Fluorene	86-73-7	100[a]	100[a]	500[b]	1,000[c]	30	386
Indeno(1,2,3-cd)pyrene	193-39-5	0.5[f]	0.5[f]	5.6	11	NS	8.2
m-Cresol	108-39-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
Naphthalene	91-20-3	100[a]	100[a]	500[b]	1,000[c]	NS	12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
o-Cresol	95-48-7	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
p-Cresol	106-44-5	34	100[a]	500[b]	1,000[c]	NS	0.33[e]
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8[e]	0.8[e]
Phenanthrene	85-01-8	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Phenol	108-95-2	100[a]	100[a]	500[b]	1,000[c]	30	0.33[e]
Pyrene	129-00-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Volatiles							
1,1,1-Trichloroethane	71-55-6	100[a]	100[a]	500[b]	1,000[c]	NS	0.68
1,1-Dichloroethane	75-34-3	19	26	240	480	NS	0.27
1,1-Dichloroethene	75-35-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33
1,2-Dichlorobenzene	95-50-1	100[a]	100[a]	500[b]	1,000[c]	NS	1.1
1,2-Dichloroethane	107-06-2	2.3	3.1	30	60	10	0.02[f]
cis-1,2-Dichloroethene	156-59-2	59	100[a]	500[b]	1,000[c]	NS	0.25
trans-1,2-Dichloroethene	156-60-5	100[a]	100[a]	500[b]	1,000[c]	NS	0.19
1,3-Dichlorobenzene	541-73-1	17	49	280	560	NS	2.4
1,4-Dichlorobenzene	106-46-7	9.8	13	130	250	20	1.8
1,4-Dioxane	123-91-1	9.8	13	130	250	0.1[e]	0.1[e]
Acetone	67-64-1	100[a]	100[b]	500[b]	1,000[c]	2.2	0.05
Benzene	71-43-2	2.9	4.8	44	89	70	0.06
Butylbenzene	104-51-8	100[a]	100[a]	500[b]	1,000[c]	NS	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76
Chlorobenzene	108-90-7	100[a]	100[a]	500[b]	1,000[c]	40	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1
Hexachlorobenzene	118-74-1	0.33[e]	1.2	6	12	NS	3.2
Methyl ethyl ketone	78-93-3	100[a]	100[a]	500[b]	1,000[c]	100[a]	0.12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Methyl tert-butyl ether	1634-04-4	62	100[a]	500[b]	1,000[c]	NS	0.93
Methylene chloride	75-09-2	51	100[a]	500[b]	1,000[c]	12	0.05
n-Propylbenzene	103-65-1	100[a]	100[a]	500[b]	1,000[c]	NS	3.9
sec-Butylbenzene	135-98-8	100[a]	100[a]	500[b]	1,000[c]	NS	11
tert-Butylbenzene	98-06-6	100[a]	100[a]	500[b]	1,000[c]	NS	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3
Toluene	108-88-3	100[a]	100[a]	500[b]	1,000[c]	36	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6
1,3,5- Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02
Xylene (mixed)	1330-20-7	100[a]	100[a]	500[b]	1,000[c]	0.26	1.6

All soil cleanup objectives (SCOs) are in parts per million (ppm).
NS=Not specified. See Technical Support Document (TSD).

Footnotes

[a] The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm. See TSD section 9.3.

[b] The SCOs for commercial use were capped at a maximum value of 500 ppm. See TSD section 9.3.

[c] The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 ppm. See TSD section 9.3.

[d] The SCOs for metals were capped at a maximum value of 10,000 ppm. See TSD section 9.3.

[e] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.

[f] For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.

[g] This SCO is derived from data on mixed isomers of BHC.

[h] The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

[i] This SCO is for the sum of endosulfan I, endosulfan II, and endosulfan sulfate.

[j] This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See TSD Table 5.6-1.

Appendix F:

SESI Supplemental RIWP

SESI CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | SITE CIVIL

Principals
Anthony Castillo, PE
Fuad Dahan, PhD, PE, LSRP
Franz W. Laki, PE
John M. Nederfield, PE
Justin M. Protasiewicz, PE
Jose M. Rodriguez, PE
Michael St. Pierre, PE

March 17, 2025 ***via email:* shawn.roberts@dec.ny.gov**

Mr. Shawn Roberts, E.I.T., Project Manager
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233

RE: Supplemental Groundwater Remedial Investigation Work Plan
252-258 Third Avenue
252-258 Third Avenue
New York City, New York 10010
NYSDEC BCP Site #C231154
SESI Project No. Project #13542

Dear Mr. Roberts:

On behalf of Gramercy 252 Owner LLC (the Volunteer), SESI Consulting Engineers (SESI) has prepared this letter to present the results of the groundwater remedial investigation (RI) and request approval for proposed supplemental groundwater RI activities at the property located at 252-258 Third Avenue, New York City, New York (the “Site”). The Site is identified as New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Site No. C231154. This work plan is prepared to propose additional RI to attempt to further assess the groundwater contamination identified during the RI, achieve vertical delineation and characterize the bedrock features and evaluate the movement of water throughout the bedrock regime.

1. PREVIOUS GROUNDWATER INVESTIGATIONS AND FINDINGS

Between June and July 2024, as part of an RI that was completed per the approved July 2023 RI work plan (RIWP) prepared by AKRF, 11 monitoring wells were installed and sampled to assess groundwater conditions at the site. Groundwater samples were collected from depths of 7 to 15 feet below the basement level and analyzed for Target Compound List + 30/Target Analyte List (TCL+30/TAL), dissolved TAL metals, per- and polyfluoroalkyl substances (PFAS), and 1,4-dioxane. The groundwater sample results are presented in Fig-1.

The results from the monitoring wells installed in June and July 2024 indicated elevated concentrations of chlorinated volatile organic compound (CVOCs) in the western section of 256 and 258 Third Avenue (Lots 30 and 29, respectively), near the property boundary with 38 Gramercy Park North (Lot 26). Specifically, tetrachloroethylene (PCE) was observed as high as 340,000 ug/L in RI-MW-02, indicative of possible dense non-aqueous phase liquid (DNAPL). RI-MW-01 and RI-MW-03 also has elevated levels of PCE (~85,000 ug/L). Wells were installed at depths ranging from 10 to 15 feet below the basement level (20-25 feet below grade), just above the bedrock per the approved RIWP. The site at 258 Third Avenue (Lot 29) historically housed a dry cleaner in the 1970s, which is the likely source of the chlorinated solvent contamination.

Based on the results presented in Fig-1, additional wells are proposed for vertical delineation of the high levels of CVOCs detected on Lots 30 and 29 and to better characterize the bedrock features and water flow through bedrock.

Although the onsite monitoring wells have not been surveyed, groundwater is expected to flow eastward, toward the East River, located approximately 2,800 feet to the east. According to the Rock Data Map of Manhattan, published by the Borough of Manhattan in 1944 (Attachment 1), the competent bedrock surface beneath the site is anticipated to dip toward the east.

2. PROPOSED SCOPE OF WORK

SESI proposes to install three (3) bedrock boreholes / monitoring wells at 258 Third Avenue to advance vertical delineation of CVOCs in groundwater and to better characterize the bedrock features and flow patterns of groundwater through bedrock (it is understood that additional wells may be required after evaluating the data generated from these three boreholes/wells). Two (2) of the proposed boreholes are near the source of the contamination and the third is proposed downgradient and downdip, with the goal of capturing the plume at depth while minimizing the risk of potential vertical cross-contamination. Fig-2 illustrates the proposed locations of the monitoring wells.

The proposed monitoring wells will be installed and sampled using the following methodology:

- Each of the three boreholes will be advanced to 75 feet below the basement level, approximately 85 feet below grade and 60 feet into bedrock.
- To prevent vertical cross-contamination during drilling, the borehole will be double-cased into at least one foot of competent rock, and the anulus between the inner case and outer case will be grouted.
- Measures will be taken to ensure there is a good seal where the casing meets competent rock and the borehole is not left open for an extended period.
- Once the grout has been given at least 24 hours to cure, drilling will commence.
- During the drilling, the onsite SESI geologist/scientist/engineer will screen the work area with a photoionization detector (PID) and documenting water level changes observed. This information will be included on the corresponding borehole logs and summary report.
- Prior to well construction, a downhole geophysics contractor will be retained to gather information related to the bedrock features and fracture orientations, and this information, along with drilling observations and rock cores will be used to determine the well construction details.
- Instrumentation will be employed to continuously log various parameters, including: temperature; single-point resistivity; spontaneous potential; fluid conductivity; natural gamma; caliper; optical and acoustic televiewer; and vertical flowmeter (under stressed and unstressed conditions).
- The geophysics contractor will provide the logs and an interpretation of the data obtained and this data.

- This data will be used to make recommendations for the most appropriate well construction details and this will be determined in consultation with the NYSDEC.
- The geophysics data will be reviewed to determine the fracture zones and their depths, the direction and angle of the fractures, and the rock layers to determine if any will act as a confining layer.
- These observations will guide the installation of the well (targeted screening interval and depth), inform if there are confining layers that may be limiting the vertical extent of CVOC impacts, and provide information to determine the location for additional wells, if necessary.
- All decisions made regarding the well placement and construction will be made in consultation with the NYSDEC.
- It is anticipated that the boreholes will be converted to permanent monitoring wells using 2" PVC riser and screen. The final depth and screening intervals will be determined based on geophysics findings, condition of the rock cores encountered during drilling and in consultation with the NYSDEC. Well screens will likely be five or ten feet in length, pending approval by the NYSDEC.
- Bentonite seal will be placed in the annular space around the well from above the sand pack to at least five (5) feet above competent rock.
- Grout will be added to the surface to complete the well; (Fig-3 presents the proposed monitoring well construction).
- Once the grout cures for at least 24 hours, the wells will be developed by pumping until clear.
- The wells will then be sampled using the low flow technique for the analysis of VOCs.
- Any waste, including development/purge water and drill cuttings, will be managed in accordance with the July 2023 Remedial Investigation Workplan (RIWP) prepared by AKRF.
- Drilling and geophysics activities will be directed and overseen by a qualified SESI scientist, geologist or engineer.
- Measures will be employed to minimize the timing between activities (drilling to geophysics, geophysics to well installation) with the goal being a maximum timeline of 24 hours between activities for each borehole.
- Work proposed in this supplemental RIWP will be performed in accordance with the Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and Community Air Monitoring Plan (CAMP) included in the July 2023 RIWP prepared by AKRF.
- If SESI's onsite geologist / scientist / engineer observes any conditions that may result in health and safety concerns or concerns related to the migration of contamination, they will be given the authority to stop work in order to assess the situation. The onsite inspector will then communicate with the project manager and the project manager with the NYSDEC to determine the path forward.
- Resumes of SESI personnel and the geophysics contractor and information related to the data deliverable and software used to evaluate the data will be provided for the NYSDEC's approval prior to conducting the field work.

If additional delineation is required after the installation and sampling of these wells, the bedrock geophysics data will be evaluated to determine additional well locations and depths to advance delineation. This will be accomplished by reviewing and extrapolating bedrock fractures, water bearing zones and flow direction to determine the best location(s) to further or complete delineation. These decisions will again be made in consultation with the NYSDEC.

We respectfully request concurrence with the proposed investigative activities before initiating the additional groundwater RI work described herein.

Should you have any questions about the enclosed, please do not hesitate to contact me at 201.452.2735.

Sincerely,

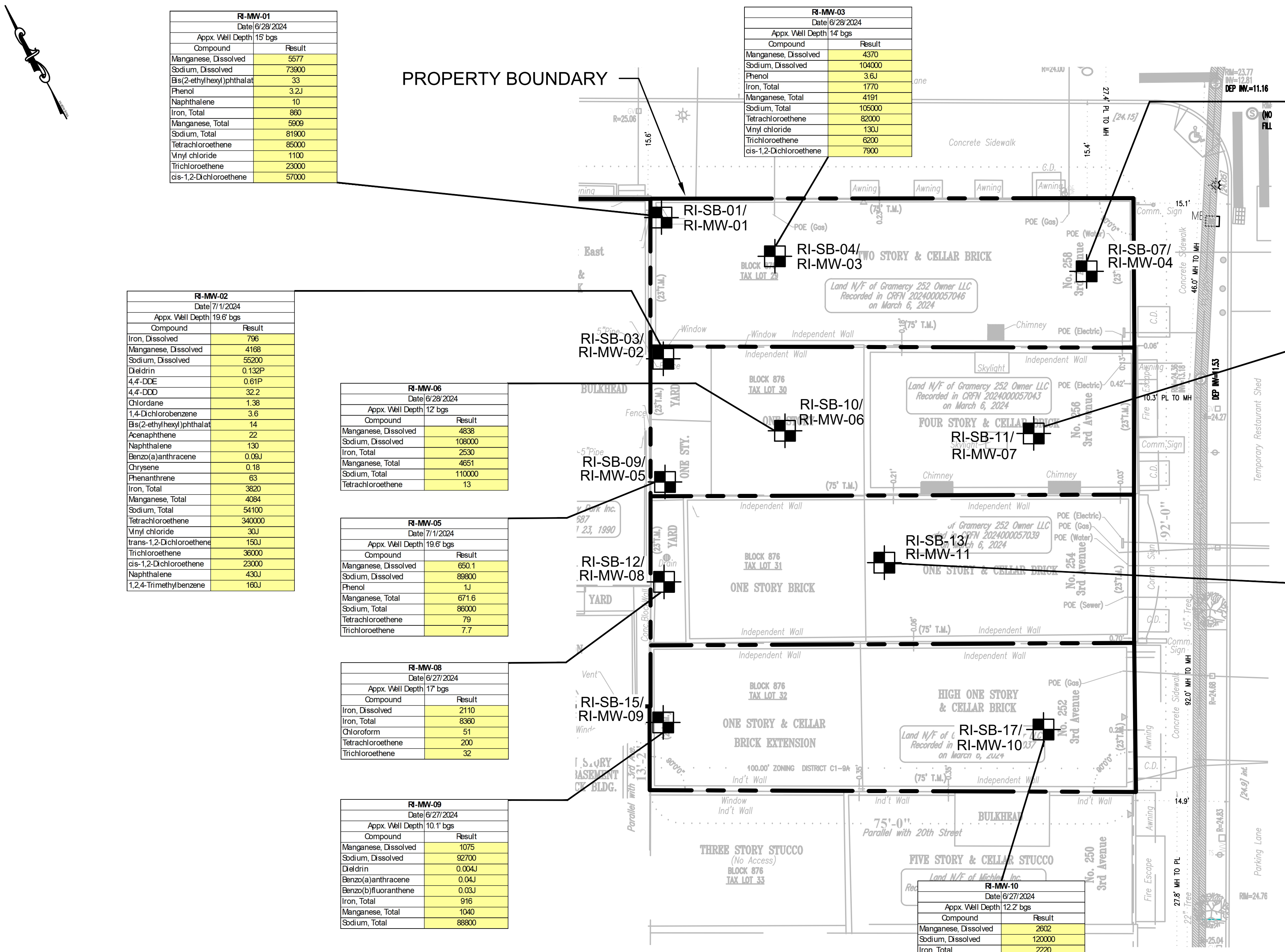
SESI CONSULTING ENGINEERS

James Vander Vliet, PE
Senior Project Engineer

Attachments:
Attachment 1: Rock Data Map of Manhattan (1944)

Figures:
Fig-1 Remedial Investigation Groundwater Sample Results
Fig-2 Proposed Monitoring Well Location Plan
Fig-3 MW-12D and MW-12DD Proposed Monitoring Well Schematic

Figures



RI-MW-01	
Date	6/28/2024
Appx. Well Depth	15' bgs
Compound	Result
Manganese, Dissolved	5577
Sodium, Dissolved	73900
Bis(2-ethylhexyl)phthalat	33
Phenol	3.2J
Naphthalene	10
Iron, Total	860
Manganese, Total	5909
Sodium, Total	81900
Tetrachloroethene	85000
Vinyl chloride	1100
Trichloroethene	23000
cis-1,2-Dichloroethene	57000

RI-MW-03	
Date	6/28/2024
Appx. Well Depth	14' bgs
Compound	Result
Manganese, Dissolved	4370
Sodium, Dissolved	104000
Phenol	3.6J
Iron, Total	1770
Manganese, Total	4191
Sodium, Total	105000
Tetrachloroethene	82000
Vinyl chloride	130J
Trichloroethene	6200
cis-1,2-Dichloroethene	7900

RI-MW-04	
Date	7/1/2024
Appx. Well Depth	14.5' bgs
Compound	Result
Manganese, Dissolved	4911
Sodium, Dissolved	109000
Iron, Total	4750
Manganese, Total	5010
Sodium, Total	100000
Tetrachloroethene	140
Benzene	3.2
Trichloroethene	7.4
cis-1,2-Dichloroethene	6.8
Isopropylbenzene	6.4
n-Propylbenzene	9.6
1,2,4,5-Tetramethylbenzene	15

RI-MW-02	
Date	7/1/2024
Appx. Well Depth	19.6' bgs
Compound	Result
Iron, Dissolved	796
Manganese, Dissolved	4168
Sodium, Dissolved	55200
Dieldrin	0.132P
4,4'-DDE	0.61P
4,4'-DDD	32.2
Chlordane	1.38
1,4-Dichlorobenzene	3.6
Bis(2-ethylhexyl)phthalat	14
Acenaphthene	22
Naphthalene	130
Benzo(a)anthracene	0.09J
Chrysene	0.18
Phenanthrene	63
Iron, Total	3820
Manganese, Total	4084
Sodium, Total	54100
Tetrachloroethene	340000
Vinyl chloride	30J
trans-1,2-Dichloroethene	150J
Trichloroethene	36000
cis-1,2-Dichloroethene	23000
Naphthalene	430J
1,2,4-Trimethylbenzene	160J

RI-MW-06	
Date	6/28/2024
Appx. Well Depth	12' bgs
Compound	Result
Manganese, Dissolved	4838
Sodium, Dissolved	108000
Iron, Total	2530
Manganese, Total	4651
Sodium, Total	110000
Tetrachloroethene	13

RI-MW-07	
Date	6/28/2024
Appx. Well Depth	12' bgs
Compound	Result
Iron, Dissolved	401
Manganese, Dissolved	3557
Sodium, Dissolved	97000
Phenol	1.1J
Naphthalene	94
Iron, Total	22000
Manganese, Total	3669
Sodium, Total	105000
n-Butylbenzene	5.6
sec-Butylbenzene	6.9
Isopropylbenzene	10
Naphthalene	150
n-Propylbenzene	12
1,2,4,5-Tetramethylbenzene	27

RI-MW-05	
Date	7/1/2024
Appx. Well Depth	19.6' bgs
Compound	Result
Manganese, Dissolved	650.1
Sodium, Dissolved	89800
Phenol	1J
Manganese, Total	671.6
Sodium, Total	86000
Tetrachloroethene	79
Trichloroethene	7.7

RI-MW-11	
Date	6/28/2024
Appx. Well Depth	18.7' bgs
Compound	Result
Manganese, Dissolved	1865
Sodium, Dissolved	110000
Phenol	6.6
Iron, Total	3820
Manganese, Total	2100
Sodium, Total	123000

RI-MW-08	
Date	6/27/2024
Appx. Well Depth	17' bgs
Compound	Result
Iron, Dissolved	2110
Iron, Total	8360
Chloroform	51
Tetrachloroethene	200
Trichloroethene	32

RI-MW-09	
Date	6/27/2024
Appx. Well Depth	10.1' bgs
Compound	Result
Manganese, Dissolved	1075
Sodium, Dissolved	92700
Dieldrin	0.004J
Benzo(a)anthracene	0.04J
Benzo(b)fluoranthene	0.03J
Iron, Total	916
Manganese, Total	1040
Sodium, Total	88800

RI-MW-10	
Date	6/27/2024
Appx. Well Depth	12.2' bgs
Compound	Result
Manganese, Dissolved	2602
Sodium, Dissolved	120000
Iron, Total	2220
Manganese, Total	2566
Sodium, Total	133000
Phenol	2.3J

Analyte	Units	NYSDEC AWQS
Chlordane	ug/l	0.05
Dieldrin	ug/l	0.004
Benzo(a)anthracene	ug/l	0.002
Benzo(a)pyrene	ug/l	0
Benzo(b)fluoranthene	ug/l	0.002
Benzo(k)fluoranthene	ug/l	0.002
Chrysene	ug/l	0.002
Indeno(1,2,3-cd)pyrene	ug/l	0.002
Hexachlorobenzene	ug/l	0.04
Phenol	ug/l	1
Antimony, Total	ug/l	3
Arsenic, Total	ug/l	25
Barium, Total	ug/l	1000
Beryllium, Total	ug/l	3
Cadmium, Total	ug/l	5
Chromium, Total	ug/l	50
Copper, Total	ug/l	200
Iron, Total	ug/l	300
Lead, Total	ug/l	25
Magnesium, Total	ug/l	35000
Manganese, Total	ug/l	300
Mercury, Total	ug/l	0.7
Nickel, Total	ug/l	100
Selenium, Total	ug/l	10
Sodium, Total	ug/l	20000
Thallium, Total	ug/l	0.5
Chloroform	ug/l	7

NOTES:

🟨 = Yellow highlight indicates the compound concentration exceeds the NYSDEC AWQS.

ABBREVIATIONS:

AWQS = Ambient Water Quality Standards
ug/l = Micrograms per liter
J- Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs)
BGS- Below Grade Surface

NOTE:
THIS PLAN IS FOR LOCATING BORING ONLY.
OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

REFERENCE
1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

NYS Education Law
Unauthorized alterations or additions to this plan are a violation of section 7209 (2) of the New York State Education Law. Copies of this map not having the seal of the engineer shall not be valid.

LEGEND:

RI-SB-15/ RI-MW-09 ⊞ - COMBINED REMEDIAL INVESTIGATION SOIL BORING NUMBER, MONITORING WELL NUMBER AND APPROXIMATE LOCATION

SCALE: 1"=20'
0 20 40

dwg by: AW
chk by: JL
scale: AS NOTED
date: 07/23/24

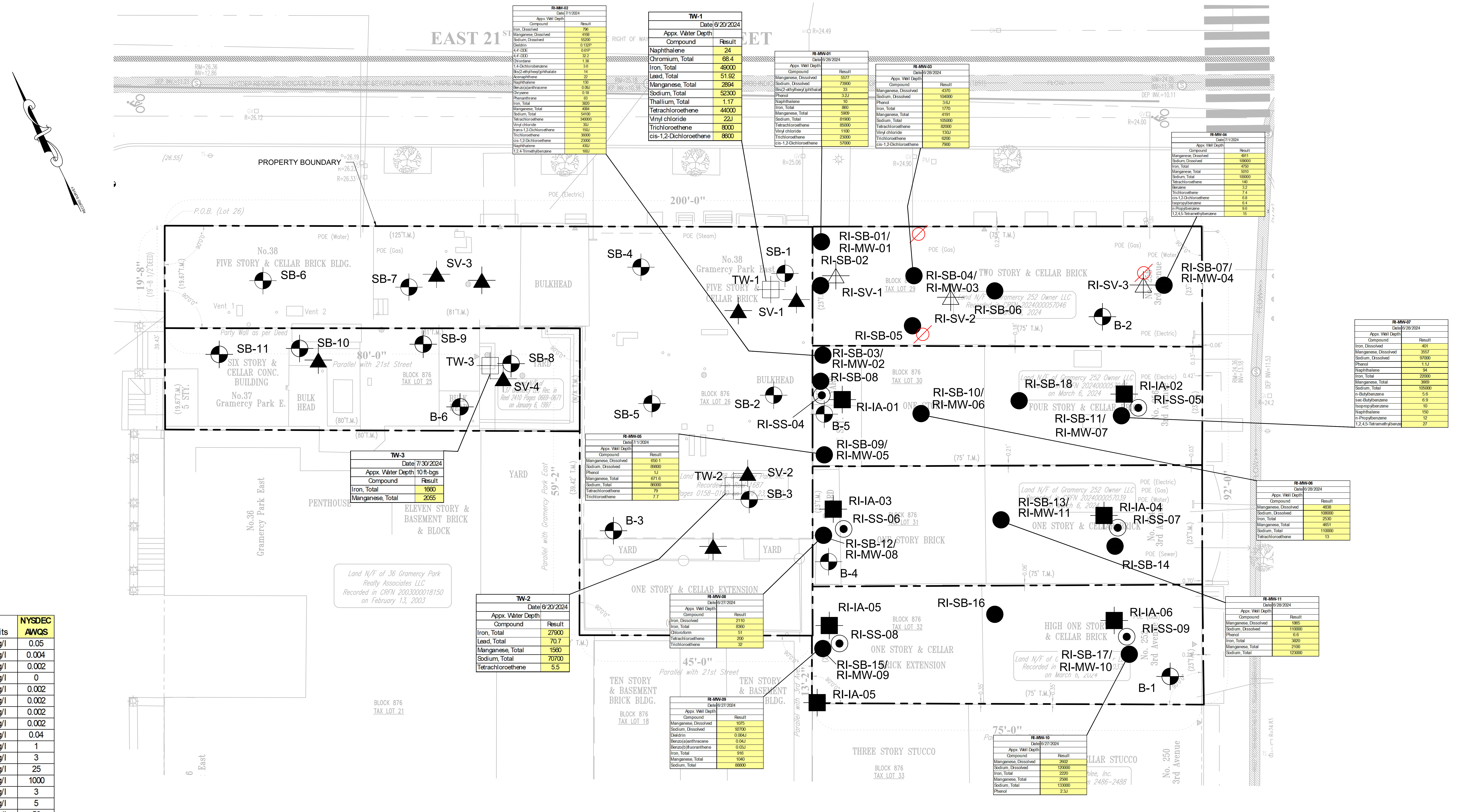
SESI CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | SITE CIVIL
959 ROUTE 46E, 3RD FLOOR, PARSIPPANY, NJ 07054 PH: 973.808.9050

project:
BCP# C231154
252 3RD AVENUE
NEW YORK, NEW YORK

title:
REMEDIAL INVESTIGATION RESULTS
GROUNDWATER

job no: 13542
drawing no:
FIG-1

N:\ACAD\13542\CAD\GEOTECH\LOCATION PLANS\13542.DWG.REM INVESTIGATION RESULTS.DWG 09/24/24 04:34:39PM, alan.ward, LAYOUT: GW



RI-MW-02	
Date	7/1/2024
Appx. Well Depth	
Compound	Result
Iron, Dissolved	796
Manganese, Dissolved	4168
Sodium, Dissolved	55200
Dieldrin	0.132P
4,4'-DDE	0.61P
4,4'-DDD	32.2
Chlordane	1.38
1,4-Dichlorobenzene	3.6
Bis(2-ethylhexyl)phthalate	14
Acenaphthene	22
Naphthalene	130
Benzo(a)anthracene	0.09J
Chrysene	0.18
Phenanthrene	63
Iron, Total	3820
Manganese, Total	4084
Sodium, Total	54100
Tetrachloroethene	340000
Vinyl chloride	30J
trans-1,2-Dichloroethene	150J
Trichloroethene	36000
cis-1,2-Dichloroethene	23000
Naphthalene	430J
1,2,4-Trimethylbenzene	160J

TW-1	
Date	6/20/2024
Appx. Water Depth	
Compound	Result
Naphthalene	24
Chromium, Total	68.4
Iron, Total	49000
Lead, Total	51.92
Manganese, Total	2894
Sodium, Total	52300
Thallium, Total	1.17
Tetrachloroethene	44000
Vinyl chloride	22J
Trichloroethene	8000
cis-1,2-Dichloroethene	8600

RI-MW-01	
Date	6/28/2024
Appx. Well Depth	
Compound	Result
Manganese, Dissolved	5577
Sodium, Dissolved	73900
Bis(2-ethylhexyl)phthalat	33
Phenol	3.2J
Naphthalene	10
Iron, Total	860
Manganese, Total	5909
Sodium, Total	81900
Tetrachloroethene	85000
Vinyl chloride	1100
Trichloroethene	23000
cis-1,2-Dichloroethene	57000

RI-MW-03	
Date	6/28/2024
Appx. Well Depth	
Compound	Result
Manganese, Dissolved	4370
Sodium, Dissolved	104000
Phenol	3.6J
Iron, Total	1770
Manganese, Total	4191
Sodium, Total	105000
Tetrachloroethene	82000
Vinyl chloride	130J
Trichloroethene	6200
cis-1,2-Dichloroethene	7900

RI-MW-04	
Date	7/1/2024
Appx. Well Depth	
Compound	Result
Manganese, Dissolved	4911
Sodium, Dissolved	109000
Iron, Total	4750
Manganese, Total	5010
Sodium, Total	100000
Tetrachloroethene	140
Benzene	3.2
Trichloroethene	7.4
cis-1,2-Dichloroethene	6.8
Isopropylbenzene	6.4
n-Propylbenzene	9.6
1,2,4,5-Tetramethylbenzene	15

RI-MW-07	
Date	6/28/2024
Appx. Well Depth	
Compound	Result
Iron, Dissolved	401
Manganese, Dissolved	3557
Sodium, Dissolved	97000
Phenol	1.1J
Naphthalene	94
Iron, Total	22000
Manganese, Total	3669
Sodium, Total	105000
n-Butylbenzene	5.6
sec-Butylbenzene	6.9
Isopropylbenzene	10
Naphthalene	150
n-Propylbenzene	12
1,2,4,5-Tetramethylbenze	27

RI-MW-05	
Date	7/1/2024
Appx. Well Depth	
Compound	Result
Manganese, Dissolved	650.1
Sodium, Dissolved	89800
Phenol	1J
Manganese, Total	671.6
Sodium, Total	86000
Tetrachloroethene	79
Trichloroethene	7.7

TW-3	
Date	7/30/2024
Appx. Water Depth	10 ft-bgs
Compound	Result
Iron, Total	1660
Manganese, Total	2055

RI-MW-06	
Date	6/28/2024
Appx. Well Depth	
Compound	Result
Manganese, Dissolved	4838
Sodium, Dissolved	108000
Iron, Total	2530
Manganese, Total	4651
Sodium, Total	110000
Tetrachloroethene	13

TW-2	
Date	6/20/2024
Appx. Water Depth	
Compound	Result
Iron, Total	27900
Lead, Total	70.7
Manganese, Total	1560
Sodium, Total	70700
Tetrachloroethene	5.5

RI-MW-08	
Date	6/27/2024
Appx. Well Depth	
Compound	Result
Iron, Dissolved	2110
Iron, Total	8360
Chloroform	51
Tetrachloroethene	200
Trichloroethene	32

RI-MW-11	
Date	6/28/2024
Appx. Well Depth	
Compound	Result
Manganese, Dissolved	1865
Sodium, Dissolved	110000
Phenol	6.6
Iron, Total	3820
Manganese, Total	2100
Sodium, Total	123000

RI-MW-09	
Date	6/27/2024
Appx. Well Depth	
Compound	Result
Manganese, Dissolved	1075
Sodium, Dissolved	92700
Dieldrin	0.004J
Benzo(a)anthracene	0.04J
Benzo(b)fluoranthene	0.03J
Iron, Total	916
Manganese, Total	1040
Sodium, Total	88800

RI-MW-10	
Date	6/27/2024
Appx. Well Depth	
Compound	Result
Manganese, Dissolved	2602
Sodium, Dissolved	120000
Iron, Total	2220
Manganese, Total	2566
Sodium, Total	133000
Phenol	2.3J

Analyte	Units	NYSDEC AWQS
Chlordane	ug/l	0.05
Dieldrin	ug/l	0.004
Benzo(a)anthracene	ug/l	0.002
Benzo(a)pyrene	ug/l	0
Benzo(b)fluoranthene	ug/l	0.002
Benzo(k)fluoranthene	ug/l	0.002
Chrysene	ug/l	0.002
Indeno(1,2,3-cd)pyrene	ug/l	0.002
Hexachlorobenzene	ug/l	0.04
Phenol	ug/l	1
Antimony, Total	ug/l	3
Arsenic, Total	ug/l	25
Barium, Total	ug/l	1000
Beryllium, Total	ug/l	3
Cadmium, Total	ug/l	5
Chromium, Total	ug/l	50
Copper, Total	ug/l	200
Iron, Total	ug/l	300
Lead, Total	ug/l	25
Magnesium, Total	ug/l	35000
Manganese, Total	ug/l	300
Mercury, Total	ug/l	0.7
Nickel, Total	ug/l	100
Selenium, Total	ug/l	10
Sodium, Total	ug/l	20000
Thallium, Total	ug/l	0.5
Chloroform	ug/l	7

NOTES:

🟨 = Yellow highlight indicates the compound concentration exceeds the NYSDEC AWQS

ABBREVIATIONS:

AWQS = Ambient Water Quality Standards

ug/l = Micrograms per liter

J- Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs)

BGS- Below Grade Surface

NOTE:

THIS PLAN IS FOR LOCATING BORINGS, TEMP WELLS AND SOIL VAPOR POINTS ONLY. OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

REFERENCE

1. EXISTING CONDITIONS & BOUNDARY IS A DOWNLOADED FILE TAKEN FROM WEBSITE ZOLA.PLANNING.NYC.GOV. - NYC DEPARTMENT OF CITY PLANNING. DATE: UNKNOWN

LEGEND:

SB-1	-	SOIL BORING & LOCATION
SV-2	-	SOIL VAPOR POINT & LOCATION
RI-SV-1	-	SUB SLAB VAPOR POINT & LOCATION
TW-2	-	TEMPORARY WELL & LOCATION
B-3	-	GEOTECHNICAL SOIL BORING NUMBER & APPROXIMATE LOCATION
RI-SB-16	-	REMEDIAL INVESTIGATION SOIL BORING NUMBER & APPROXIMATE LOCATION
RI-SB-15/ RI-MW-09	-	COMBINED REMEDIAL INVESTIGATION SOIL BORING NUMBER, MONITORING WELL NUMBER AND APPROXIMATE LOCATION
SB-4	-	COMBINED REMEDIAL INVESTIGATION SOIL BORING NUMBER, MONITORING WELL NUMBER AND APPROXIMATE LOCATION
∅	-	PROPOSED LOCATION OF BOREHOLE/ MONITORING WELL

Scale: 1"= 20'

0 10 20 40 60 80

N:\ACAD\13542\CAD\GEOTECH\LOCATION PLANS\13542\DWG PRO MW LOCATION.DWG 03/17/25 04:17:55PM, dion.wood, LAYOUT: GW (37 & 38 252-258 GRAMERCY)

rev	date	description	by

dwg by: AW
chk by: JL
scale: AS NOTED
date: 08/01/2024

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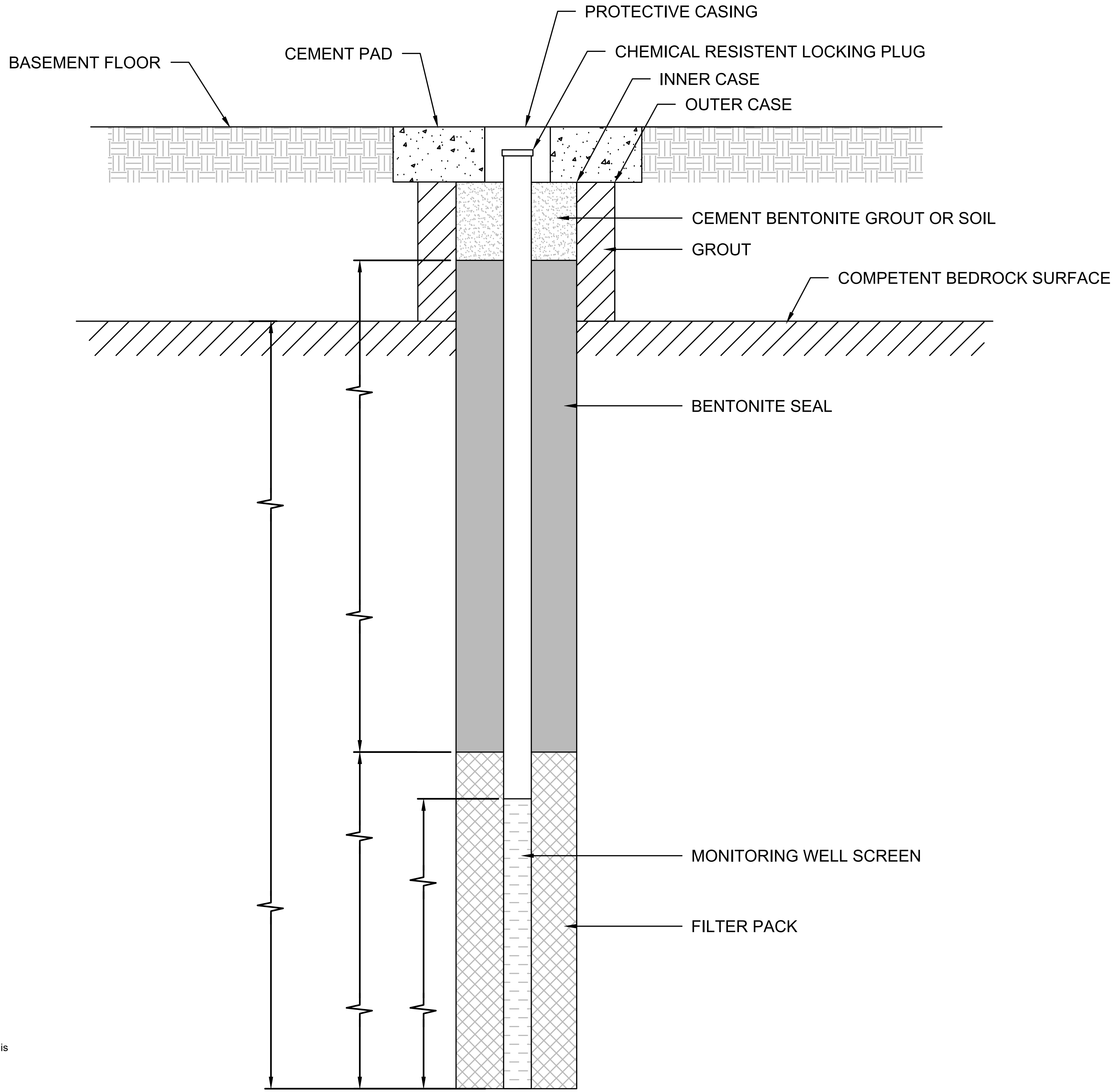
GEOTECHNICAL | ENVIRONMENTAL | SITE CIVIL
959 ROUTE 46E, 3RD FLOOR, PARSIPPANY, NJ 07054 PH: 973.808.9050

37, 38 & 252 TO 258 GRAMMERCY PARK EAST
NEW YORK, NEW YORK

title: PROPOSED MONITORING WELL LOCATIONS

job no. 13542
drawing no.

FIG-2



N:\ACAD\13542\CAD\ENVIRONMENTAL\13542.DWG.WELL SCHEMATIC.DWG 09/24/24 04:38:44PM, alan.ward, LAYOUT:PROP BEDROCK WELL

dwg by: AW
chk by: SL
scale: N.T.S.
date: 09/18/2024

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project:
37, 38 & 252 TO 258 GRAMMERCY PARK EAST
NEW YORK, NEW YORK

title:
MW-12D AND MW-12DD
PROPOSED MONITORING WELL SCHEMATIC

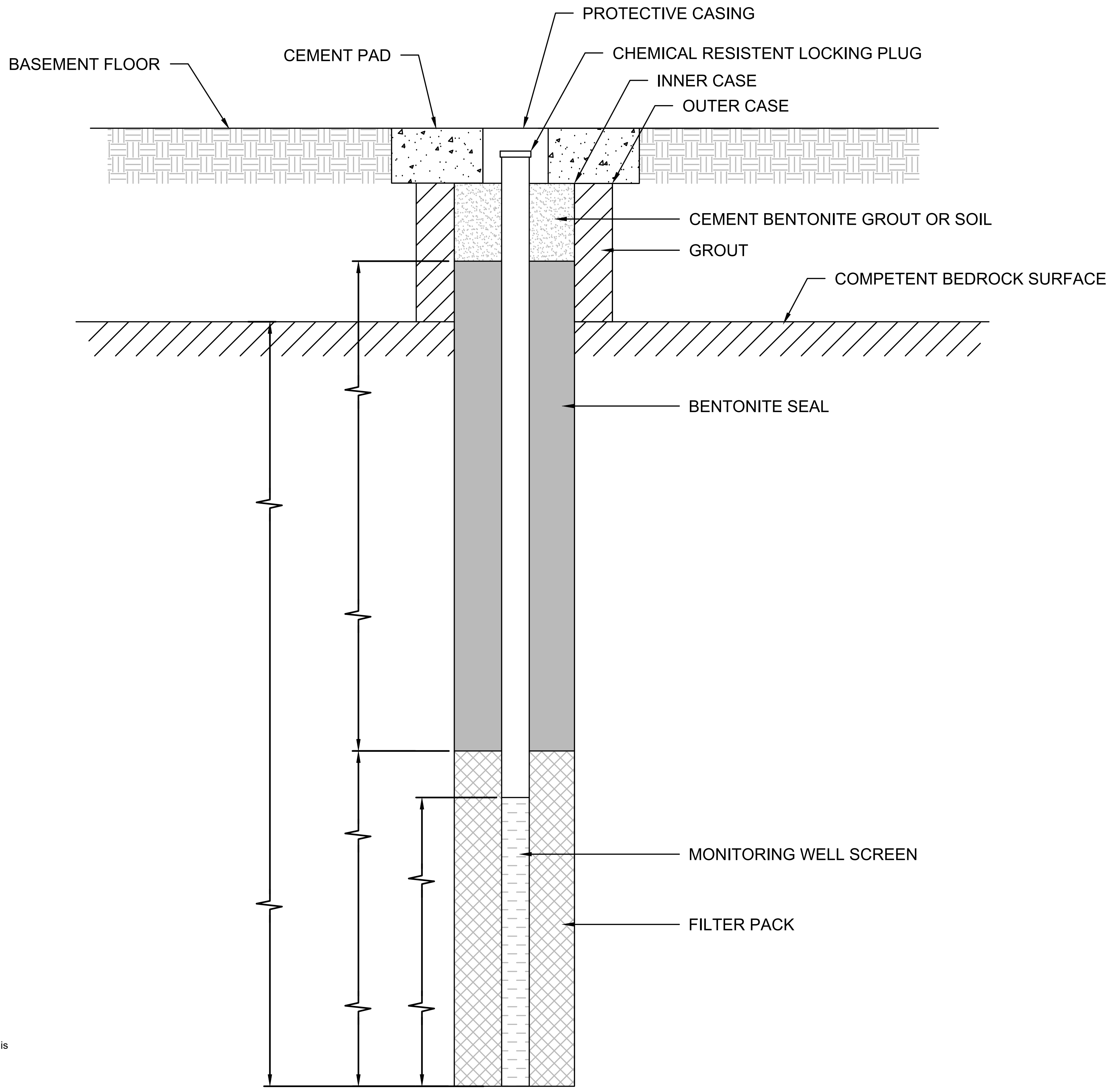
job no: 13542
drawing no:

FIG-3

1 OF 1

Appendix G:

Typical Well Construction Diagram



NYS Education Law
Unauthorized alterations or additions to this plan are a violation of section 7209 (2) of the New York State Education Law. Copies of this map not having the seal of the engineer shall not be valid.

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dwg by: AW
chk by: SL
scale: N.T.S.
date: 09/18/2024

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project:
37, 38 & 252 TO 258 GRAMMERCY PARK EAST
NEW YORK, NEW YORK

title:
PROPOSED MONITORING WELL SCHEMATIC

job no: 13542
drawing no:

FIG-3