37-24 & 37-28 30TH STREET

REDEVELOPMENT SITE

QUEENS COUNTY

LONG ISLAND CITY, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: C241214

Prepared for:

31st Avenue Associates LLC

1836 Gilford Avenue

New Hyde Park, NY 11040

37-26 30th Street LLC

1836 Gilford Avenue

New Hyde Park, NY 11040

Prepared by:

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

DECEMBER 2021

CERTIFICATION STATEMENT

I, Gary A. Rozmus, certify that I am currently a NYS registered professional engineer and that this Site Management 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).

Gary A Rozmus	12/23/2021	
NYS Professional Engineer #056744	Date	Signature

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List of Acronyms

Acronym	Definition
6NYCRR	Title 6 New York Codes, Rules and Regulations
ASP	Analytical Services Protocol
AST	Aboveground Storage Tank
AWQS	Part 703.5 Class GA Ambient Water Quality Standards and Guidance Values
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
C&D	Construction and Demolition Debris
CAMP	Community Air Monitoring Program
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
CLD	Contract Laboratory Program
COCs	Contaminants of Concern
CPP	Citizen Participation Plan
CQAP	Construction Quality Assurance Plan
DER-10	Division of Environmental Remediation-10 Technical Guidance for Site Investigation and Remediation
DMM	Division of Materials Management
DUSR	Data Usability Summary Report
EC/IC	Engineering Control/Institutional Control
ECL	Environmental Conservation Law
EDD	Electronic Data Deliverable
EIMS	Environmental Information Management System
ELAP	Environmental Laboratory Accreditation Program
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
FER	Final Engineering Report
GEI	GEI Consultants, Inc., P. C.
GPR	Ground Penetrating Rader
GPS	Global Positioning System
GQS	Groundwater Quality Standards
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	High-Density Polyethylene
IRM	Intermediate Remedial Measure
IRMWP	Interim Remedial Measure Work Plan
ISCO	In Situ Chemical Oxidation
LDPE	Low-Density Polyethylene
MS/MSD	Matrix Spikes and Matrix Spike Duplicate
MTA	Metropolitan Transportation Authority
NYCDEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings

Acronym	Definition
NYCDOT	New York City Department of Transportation
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethylene
PFAS	Perfluoroalkyl and Polyfluoroalkyl Substances
PFOA	Per-fluorooctanoic Acid
PFOS	Per-fluorooctanesulfonic Acid
PGWSCOs	Protection of Groundwater Soil Cleanup Objectives
PID	Photoionization Detector
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QEP	Qualified Environmental Professional
QHHEA	Quantitative Human Health Exposure Assessment
RAO	Remedial Action Objectives
RAWP	Remedial Action Work Plan
RECs	Recognized Environmental Conditions
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
RRUSCO	Restricted Residential Use Soil Cleanup Objectives
SCGs	Standards, Criteria and Guidance values
SCOs	Soil Cleanup Objectives
SDS	Safety Data Sheet
SEQRA	State Environmental Quality Review Act
SIM	Selective Ion Monitoring
SMP	Site Management Plan
SoMMP	Soil/Materials Management Plan
SOP	Standard Operating Procedure
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-Slab Depressurization System
SSO	Site Safety Officer
SVI	Soil Vapor Intrusion
SVOC	Semi-Volatile Organic Compound
SWPPP	Storm-Water Pollution Prevention Plan
TAL	Target Analyte List
TCE	Trichloroethylene
TCL	Target Compound List
TOGS	Technical & Operational Guidance Series
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank

Acronym	Definition
UUSCO	Unrestricted Use Soil Cleanup Objectives
VOCs	Volatile Organic Compounds
Measurements	
CY	Cubic Yard
ft. bgs	Feet Below Ground Surface
L/min	Liters per Minute
mg/kg	Milligrams per Kilogram
ng/L	Nanograms per Liter
NTU	Nephelometric Turbidity Unit
PM-10	Particulate Matter 10 Micrometers or less in diameter
ppm	Parts per Million
sf	Square Yard
µg/L	Micrograms per Liter
$\mu g/m^3$	Micrograms per Cubic Meter

ES Executive Summary

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Identification: NYSDEC BCP Site No. C241214
37-24 & 37-28 30th Street Redevelopment Site
37-24 and 37-28 30th St, Long Island City, New York

Institutional Controls:	1. Require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
	2. Allow the use and development of the controlled property for restricted residential use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
	3. Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or NYCDOHMH; and
	4. Require compliance with the Department approved Site Management Plan.
Engineering Controls:	1. Monitoring wells associated with in situ chemical oxidation; and
	2. Sub-slab depressurization system (SSDS).

Inspections:	Frequency
1. Site-wide Inspection	Annually
Monitoring:	
1. Groundwater Monitoring Wells MW-P1 through MW-P4.	Quarterly
2. SSDS monitoring points MP-1 through MP-8.	Quarterly

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Maintenance:	
1. SSDS.	Quarterly
Reporting:	
1. Groundwater Monitoring Report	Quarterly
2. Periodic Review Report	Annually

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 Introduction

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the 37-24 & 37-28 30th Street Redevelopment Site located in Long Island City, New York (hereinafter referred to as the "Site"). See **Figure 1**. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP), Site No. C241214, which is administered by New York State Department of Environmental Conservation (NYSDEC or Department).

31st Avenue Associates LLC and 37-26 30th Street LLC entered into a Brownfield Cleanup Agreement (BCA) on September 17, 2018 with the NYSDEC to remediate the site. A figure showing the site location and boundaries of this site is provided in **Figure 2**. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in **Appendix A**.

After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement, granted to the NYSDEC, requires compliance with this SMP and all ECs and ICs placed on the site. The environmental easement for the site was recorded in the Office of the City Register of the City of New York (City Register File No. 2021000441699). A copy of the easement and proof of filing are included in **Appendix A.**

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 NYCRR Part 375 and the BCA (Index # C241214-08-13; Site # C241214) for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in **Appendix B** of this SMP.

This SMP was prepared by GEI, on behalf of 31st Avenue Associates LLC and 37-26 30th Street LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. The NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the site, the NYSDEC project manager will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

1. 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6 NYCRR Part 375 and/or Environmental Conservation Law.
2. 7-day advance notice of any field activity associated with the remedial program.
3. 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan. If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above mentioned 60-day advance notice is also required.

4. Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
5. Notice within 48 hours of any non-routine maintenance activities.
6. Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
7. Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

1. At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Brownfield Cleanup Agreement (BCA), and all approved work plans and reports, including this SMP.
2. Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Contact information for the above notifications is listed below. The information on this list will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in **Appendix B**.

Notifications*

Name	**Contact Information**	**Required Notification****
Steve Walsh Assistant Engineer (Environmental) Bureau B, Section B Division of Environmental Remediation New York State Department of Environmental Conservation 625 Broadway Albany, NY 12233	(518) 402-9824 steven.walsh@dec.ny.gov	All Notifications
Shaun J. Surani Bureau of Environmental Exposure Investigation New York State Department of Health Empire State Plaza Corning Tower, Room 1787 Albany, New York, 12237	(518) 402-1338 Shaun.Surani@health.ny.gov	Notifications 4, 6, and 7

* Note: Notifications are subject to change and will be updated as necessary.

** Note: Numbers in this column reference the numbered bullets in the notification list in this section.

2.0 Summary of Previous Investigations and Remedial Actions

2.1 Site Location and Description

The site is located in Long Island City, Queens County, New York and is identified as Block 371 and Lots 33 and 34 on the New York City Tax Map (see **Figure 1**). The site is an approximately 0.368-acre area and is bounded by a two-story office building to the north, an auto repair shop and two residential houses to the south, 30th Street to the east, and Old Ridge Road to the west (see **Figure 2** – Site Map). The boundaries of the site are more fully described in **Appendix A** – Environmental Easement, Survey, Metes and Bounds. The owner(s) of the site parcel(s) at the time of issuance of this SMP is 37-26 30th Street LLC.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: two partially constructed 7-story residential buildings. The Site is zoned M1-2/R6A (mixed industrial and residential) and is currently undergoing redevelopment for residential use. Site occupants include construction contractors.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include industrial and residential properties. The properties immediately south of the Site include industrial and residential properties; the properties immediately north of the Site include industrial properties; the properties immediately east of the Site include industrial properties; and the properties to the west of the Site include industrial properties.

2.2.2 Geology and Hydrogeology

Based on the geotechnical report provided by GTA and the RI performed by GEI, the subsurface conditions consist of historic fill soils, glacial outwash sand deposits, and bedrock. A fill layer consisting of soils mixed with construction debris was identified Site-wide extending to a depth of approximately 3-ft. bgs. Native soils were present beneath the fill layer, consisting of fine to medium sand and silt with varying percentages of gravel, and occasional cobbles and boulders. Weathered bedrock was encountered at depths

varying from approximately 47- to 74-ft. bgs. Site specific boring logs are provided in **Appendix C**.

No evidence of perched water was observed during the RI. Based upon regional topography, groundwater was presumed to flow in a northwesterly direction toward the East River. Water level measurements collected during the RI indicated flow in a westerly direction. Groundwater levels measured in the monitoring wells located on-Site varied between approximately 26- to 29-ft. bgs. A groundwater contour map developed from data collected during the RI is shown in **Figure 3.** A groundwater contour map developed from data collected following implementation of the RAWP is shown in **Figure 4**. Groundwater monitoring well construction logs are provided in **Appendix D**.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

Historic Sanborn Maps show that the Site was occupied by a residential building from at least 1898 until it was replaced with a two- and one-story commercial structure with partial basement on Tax Lot 34 constructed circa 1936. The one-story commercial structure formerly located on Tax Lot 33 was constructed circa 1947. Historic use of the Site includes manufacturing metal products and plastics (approx. 1947-1970), carpet cleaning (approx. 1967-1970), printing (approx. 1983-1991), dry cleaning (approx. 1996 to 2018), and auto repair (approx. 2000 to 2018).

Until August 2018, the Site was used for two commercial dry-cleaning businesses and one auto repair business and contained three separate tenant spaces. The Site features included a one-story structure with partial two-story section and partial basement located within the auto repair business parcel, which is approximately 400-square feet in size. The auto repair shop, Millennium Auto Collision, occupied half of Tax Lot 34 with the physical address of 37-28 30th Street; the first dry-cleaner, Enterprise Cleaners, occupied the remaining half of Tax Lot 34, with the physical address of 37-26 30th Street; and the second dry-cleaner, Season Wash, occupied Tax Lot 33, with the physical address of 37-24 30th

Street. As of August 2018, the Site had been purchased and all tenants had vacated the properties.

Four investigations and one Interim Remedial Measure (IRM) were conducted at the Site. The reports describing these investigations and the IRM are listed below. Each report is summarized in the following subsections.

- Phase I Environmental Site Assessment (ESA), prepared by Hillman Consulting, dated April 2017;
- Phase II ESA, prepared by Athenica Environmental Services, Inc., dated June 2017;
- Subsurface geotechnical report, prepared by GTA Engineering Services of New York, P.C., dated November 2018; and
- Remedial Investigation Report, prepared by GEI, dated January 2020.
- Interim Remedial Measure Construction Completion Report, prepared by GEI, dated November 2021.

2.3.1 April 2017 Phase I ESA

A Phase I Environmental Site Assessment (ESA) was completed in April 2017 by Hillman Consulting for the properties located at 37-24 and 37-28 30th Street, Long Island City, New York. The assessment included a site inspection, historical research, and a regulatory review of the properties. The report identified and discussed the Sanborn maps associated with the properties. The partial basement of the auto repair business was unable to be accessed during conduction of this Phase I.

Recognized Environmental Conditions (RECs) were identified by Hillman associated with the property use (historic and present), the previously identified five aboveground storage tanks (ASTs) and a nearby property with known trichloroethylene (TCE) groundwater contamination. This nearby property, located at address 37-26 30th Street that is the historic location of a dry cleaner (and a portion of the current BCP Site), would be further investigated under a limited subsurface investigation completed in June 2017 that encompassed the three properties associated with the Site.

2.3.2 June 2017 Phase II ESA

A Phase II ESA was completed by Athenica Environmental Services, Inc. in June 2017 in response to the RECs identified as part of the Applicants' pre-acquisition due

diligence. The following scope of work was completed to identify impacts to the subsurface:

- Performed a Ground Penetrating Rader (GPR) survey.
- Installed nine soil borings and collected 18 soil samples for analysis.
- Installed five groundwater monitoring wells to establish groundwater flow and collected five groundwater samples for analysis.
- Installed four sub-slab soil vapor implants and four soil vapor probes and collected four soil vapor samples, four sub-slab vapor samples with four co-located indoor air samples, and one ambient outdoor air sample for chemical analysis.

Soil/fill samples collected during the Phase II were compared to Title 6 New York Codes, Rules and Regulations (6NYCRR) Part 375-6.8 Unrestricted Use Soil Cleanup Objectives (SCOs) and Restricted Residential Use SCOs. The findings of the soil results were consistent with concentrations and exceedances of compounds commonly associated with historic fill soils, with exceedances recorded mostly of semi-volatile organic compounds (SVOCs) and metals. Most of the soil borings samples were collected from the 0 to 2-feet below ground surface (ft. bgs) and 12 to 14-ft. bgs intervals.

Groundwater samples collected during the Phase II were compared to 6NYCRR Part 703.5 Class GA Ambient Water Quality Standards (AWQS). Only the volatile organic compounds (VOCs) chloroform and tetrachloroethylene (PCE) were detected above their respective AWQS at the Site. SVOCs, metals, and pesticides, were detected slightly above their respective AWQS, but were attributed to the turbidity of the groundwater prior to laboratory filtering.

Soil vapor and sub-slab samples collected during the Phase II were compared to the compounds listed in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2006), with updates (SVI Guidance). PCE and TCE in indoor air were compared to the Air Guidance Values as presented in Table 3.1 of the NYSDOH Soil Vapor Intrusion Guidance. The results of the comparison have identified the requirement for mitigation of PCE and TCE at the Site. Other VOCs in the indoor air were compared to the upper fence value found in fuel oil heated homes according to a NYSDOH 2003 study. Thirty-two VOCs were detected at or

above their respective method detection limits with 10 VOCs detected at elevated concentrations.

2.3.3 November 2018 Geotechnical Exploration Report

A geotechnical investigation of the Site was conducted in September 2018 by GTA Engineering Services of New York, P.C. (GTA). The relevant findings of the investigation include the identification of an uncontrolled fill layer underneath the Site, consisting of sand with minor amounts of concrete debris, which is underlain by native soil and bedrock.

The borings were advanced to completion depths ranging from approximately 52- to 79-ft. bgs. The surface of the Site consisted of either a 2-inch concrete floor slab or a 3-inch-thick layer of asphalt. The layer of fill material comprised of loose sand with minor amounts of debris was encountered beneath the surface material, ranging in depth below the surface layer approximately 1- to 3-ft. Naturally deposited soils that were encountered below the fill material consisted of poorly graded sand, silty sand, and sandy silt with varying percentages of gravel, and occasional cobbles and boulders. Slightly weathered gneiss bedrock was encountered at depths ranging from approximately 50- to 74-ft. bgs, becoming shallower towards the south portion of the Site.

2.3.4 January 2020 Remedial Investigation Report

A Remedial Investigation (RI) was conducted by GEI in January and February 2019.

A total of 12 soil borings were advanced to 30-ft. bgs and sampled at 5-ft. intervals. Exceedances of the 6NYCRR Part 375-6.8 UUSCOs were detected only in the upper 10-ft. and were limited to metals and one pesticide.

Six clusters of monitoring wells were installed and sampled to assess groundwater quality. Of these, five consisted of one shallow well, screened at approximately 25- to 35-ft. bgs, and one intermediate well, screened 10-feet directly above the encountered bedrock, with final screen depth ranging from 47- to 52.5-ft. bgs. Because bedrock was encountered at a deeper elevation at the MW-3 cluster location, a monitoring well with a deep screen interval was installed and screened 10-feet directly above the encountered bedrock

(approximately 58- to 68-ft. bgs) in addition to the shallow and intermediate screened wells at this location.

Groundwater exceedances of the 6NYCRR Part 703.5 AWQS included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and metals. The SVOC exceedances were limited to two monitoring wells, were minor in nature, and are not considered Contaminants of Concern (COCs). The metal detections and exceedances in groundwater are most likely naturally occurring or related to road salt application and are not COCs for this Site.

VOC impacts in the groundwater were limited to the COCs: PCE and TCE, excepting one chloroform exceedance, and were detected throughout the Site. TCE was detected at all shallow monitoring wells installed, but only exceeded the AWQS in MW-2S (concentration of 5.2 micrograms per liter [µg/L]) and in the only deep screened monitoring well MW-3D (concentration of 8.9 µg/L). PCE was detected at every temporary monitoring well with exceedances observed at eight locations including the duplicate sample collected at MW-5I.

Emerging contaminants 1,4-dioxane and perfluoroalkyl and polyfluoroalkyl substances (PFAS) compounds were sampled in the groundwater at an upgradient and downgradient monitoring well. 1,4-Dioxane was detected in one monitoring well above the Maximum Contaminant Level (MCL) of 1 part per billion (ppb). Analytical results collected from monitoring wells MW-2S and MW-3S are below the August 2020 New York State Drinking Water MCL established for per-fluorooctanesulfonic acid (PFOS) of 10 parts per trillion (ppt), but above 10 ppt for per-fluorooctanoic acid (PFOA). Analytical results collected from monitoring well MW-3S are above the MCL of 10 ppt for both PFOS and PFOA. No historical on- or off-site sources were identified for 1,4-dioxane, PFOA, or PFOS.

Chlorinated VOCs, primarily PCE and TCE, were detected in all seven of the soil vapor sample locations. Elevated levels of chlorinated VOCs were generally found throughout the Site, with the highest detection located in the north and eastern portions of the Site. Petroleum-related VOCs were detected in four of the seven soil vapor samples collected.

Five inactive aboveground storage tanks (ASTs) were identified: three 275-gallon fuel oil ASTs located within the 37-26 30th Street tenant space, one 275-gallon waste oil AST located within the 37-28 30th Street tenant space, and one approximately 2,500-gallon capacity heating oil AST located within the partial basement below the former Millennium Auto Collision tenant.

2.3.5 November 2021 Interim Remedial Measure Construction Completion Report

GEI conducted an Interim Remedial Measure (IRM) excavation between September 2020 and February 2021. The objective of the IRM was to identify any potential contaminant source in the soil media in the redevelopment depth interval. The upper 9.5- to 14.5-ft. of the Site was excavated in a grid system pattern and screened in the field for VOCs, odors, and visual evidence of impacts. No impacted soil was observed. Confirmation end-point soil samples were collected from the excavation bottom and sidewalls. All end-point sample results were below UUSCOs.

2.3.6 Conceptual Model of On-Site Contamination

Soil impacts were limited to one pesticide exceedance and metals that are likely naturally occurring; neither are considered COCs for the Site. Metals concentrations did not exceed Restricted Residential Use Cleanup Objectives (RRSCOs). Metals concentrations exceeding UUSCOs occurred in four soil borings (SB-2, SB-6, SB-11, and SB-12) and were limited to mercury (maximum 0.43 mg/kg in SB-12 (0'-5')), nickel (maximum 44.9 mg/kg in SB-6 (5'-10')), and zinc (maximum 190 mg/kg in SB-12 (0'-5')).

Groundwater impacts included VOCs, SVOCs, and metals exceeding AWQS. Minor SVOC exceedances and detections were noted in the groundwater and were not considered COCs. Metals exceedances were considered naturally occurring and were not considered COCs. The VOC exceedances, excepting chloroform, were limited to the Site-specific COCs, i.e., PCE and TCE. TCE was detected at all shallow monitoring wells installed, but only exceeded the NYSDEC AWQS in two wells: MW-2S and MW-3D (the only deep screened well). PCE was detected at every temporary monitoring well, with exceedances observed at eight locations. Investigations completed prior to remedial action did not identify a source of groundwater contamination. It is highly probable that residual

contaminants were present in the groundwater originating from the historic use of the eastern portion of Tax Lot 34 as dry-cleaning facilities.

Soil vapor impacts included elevated levels of chlorinated VOCs, which were found throughout the Site, with the highest detections located in the north and eastern portions of the Site. Consistent with groundwater contamination sources, soil vapor concentrations were likely related to the former dry-cleaning facilities that historically operated within the eastern portion of Tax Lot 34. Petroleum-related VOCs were detected in four of the seven soil vapor samples collected. No on- or off-Site sources were identified.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated January 25, 2021 are as follows:

Groundwater

RAOs for Public Health Protection

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

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.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

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

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.

2.5 Remedial Action

The site was remediated in accordance with the remedy selected by the NYSDEC in the Decision Document dated January 2021.

The factors considered during the selection of the remedy are those listed in 6NYCRR 375-1.8. The following are the components of the selected remedy, as described in the Decision Document:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:
    - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
    - Reducing direct and indirect greenhouse 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;
    - Maximizing habitat value and creating habitat when possible;
    - 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; and
    - Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction;
2. In-situ chemical oxidation (ISCO) was implemented to treat the groundwater contaminated with volatile organic compounds (VOCs). A chemical oxidant was injected into the subsurface to destroy the contaminants across the site. The Department will determine if additional injections are necessary.

Monitoring will be conducted for contaminants of concern upgradient and downgradient of the site to determine if the contaminants of concern (COCs) are reduced to below groundwater standards or asymptotic levels. This level of groundwater treatment must be achieved within 5 years of the date of the Certificate of Completion or the remedy would result in a Track 2 Restricted Residential cleanup.

3. Any on-site buildings will be required to have a sub-slab depressurization system, or other acceptable measures, to mitigate the migration of vapors into the building from soil and/or groundwater. The system and any vapor intrusion monitoring must no longer be needed within 5 years of the date of the Certificate of Completion, or the remedy would result in a Track 2 Restricted Residential cleanup.

4. If no EE or SMP is needed to achieve soil, or soil vapor remedial action objectives, then the following local use restriction will be relied upon to prevent ingestion of groundwater: Article 141 of the NYCDOHMH code, which prohibits potable use of groundwater without prior approval.

Contingent Remedy Elements (Paragraphs 5 and 6)

In the event that Track 1 unrestricted use is not achieved, including achievement of groundwater and soil vapor remedial objectives, the following contingent remedial elements will be required, and the remedy will achieve a Track 2 Restricted Residential cleanup. The Track 2 cleanup would require an Environmental Easement and Site Management Plan.

1. Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

   - Require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3).
   - Allow the use and development of the controlled property for restricted residential use as defined by Part 375-1.8(g), although land use is subject to local zoning laws.
   - Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or NYCDOHMH.
   - Require compliance with the Department approved Site Management Plan.

2. A Site Management Plan is required, which includes the following:

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

- Institutional Controls: The Environmental Easement is discussed in Paragraph 5 above.
- Engineering Controls: The in-situ chemical oxidation and the sub-slab depressurization system are discussed in Paragraphs 2 and 3, respectively.

This plan includes, but may not be limited to:

- Descriptions of the provisions of the environmental easement including any land use, and groundwater.
- Provisions for the management and inspection of the identified engineering controls.
- Maintaining site access controls and Department notification.
- The steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.
- A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
  - Monitoring of groundwater and soil vapor to assess the performance and effectiveness of the remedy.
  - A schedule of monitoring and frequency of submittals to the Department.
- An Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:
  - procedures for operating and maintaining the remedy;
  - compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
  - maintaining site access controls and Department notification; and
  - providing the Department access to the site and O&M records.

2.6 Remaining Contamination

2.6.1 Soil

All confirmation end-point soil samples collected after completion of the remedial excavation were below Unrestricted Use SCOs. **Figure 5** shows the end-point soil sample

locations. **Table 1** summarizes the results of all soil samples collected at the site after completion of remedial action.

2.6.2 Groundwater

Groundwater samples were collected from the ISCO monitoring network during the first and second quarters of 2021 to assess the effectiveness of the ISCO remedy, which was implemented in December 2020 and January 2021. The first quarter (Q1) samples were collected on March 25 and 29, 2021, approximately two months after the completion of the ISCO injection program. The second quarter (Q2) samples were collected on June 29, 2021. Low flow sampling methodology was used in accordance with the CQAP, included as an appendix to the RAWP.

In the Q1 2021 samples, exceedances of the AWQS were limited to the COC tetrachloroethene (PCE) and the following metals: chromium, iron, manganese, sodium, and mercury.

PCE concentrations exceeded the AWQS of 5 µg/L in all four wells. The maximum concentration (140 µg/L) occurred in MW-P1, located on the southeast (upgradient) side of the Site, a reduction from the pre-ISCO level of 220 µg/L. The concentration in MW-P3, located on the southwest (downgradient) side of the Site, decreased to 45 µg/L from 110 µg/L pre-ISCO. The concentrations in MW-P2 (31 µg/L) and MW-P4 (25 µg/L), located upgradient of the northeast Site boundary and downgradient of the northwest Site boundary, respectively, did not change significantly from their pre-ISCO levels. The presence of PCE in the two upgradient wells both before and after ISCO implementation indicate the possibility of an off-Site source of PCE contamination.

The metals exceedances are comparable to results from the previous quarter, with the exception of mercury, which was detected at 1.6 µg/L in MW-P3 (1.8 µg/L in the duplicate). The AWQS for mercury is 0.7 µg/L. Mercury was not detected in any groundwater monitoring wells in the previous quarter.

In the Q2 2021 samples, exceedances of the AWQS were limited to PCE and the following metals: chromium, copper, iron, lead, manganese, nickel, sodium, and mercury.

PCE concentrations exceeded the AWQS of 5 µg/L in all four wells but were lower than results from the previous quarter.

The highest PCE concentration (66 µg/L [72 µg/L in the duplicate]) occurred in MW-P1, located on the southeast (upgradient) side of the Site. Quarterly sampling results to date show a decreasing trend from the pre-ISCO level of 220 µg/L in this well.

The PCE concentration in MW-P3, located on the southwest (downgradient) side of the Site, was 27 µg/L. Quarterly sampling results to date show a decreasing trend from the pre-ISCO level of 110 µg/L.

PCE concentrations in MW-P2 and MW-P4, both located on the north side of the Site, showed little change between Q4 2020 (pre-ISCO) and Q1 2021 (post-ISCO), but the concentrations in both wells were lower in Q2 2021 than in the previous quarter. The Q2 2021 concentrations in MW-P2 and MW-P4 were 26 µg/L and 11 µg/L, respectively.

Metals concentrations were generally higher than in the previous two quarters, with exceedances of chromium, copper, lead, and nickel occurring for the first time since monitoring began. Iron and manganese exceedances recurred at concentrations higher than in the previous two quarters. Sodium exceedances recurred at concentrations lower than in the previous two quarters. Mercury, which historically has only been detected in MW-P3, decreased from 1.6 µg/L (1.8 µg/L in the duplicate) in Q1 2021 to 0.82 µg/L. The AWQS for mercury is 0.7 µg/L.

Table 2 presents pre-ISCO baseline results from samples collected in December 2020. **Table 3** presents the results of the first post-ISCO sampling event performed in March 2021. **Table 4** presents the results of the second post-ISCO sampling event performed in June 2021. **Figure 6** shows a box map of groundwater exceedances before and after ISCO injections were completed.

2.6.3 Soil Vapor

An active sub-slab depressurization system (SSDS) is being constructed in each of the two on-Site buildings as part of redevelopment to mitigate the elevated levels of PCE and TCE in soil vapor detected in samples collected during the RI.

3.0 Institutional and Engineering Control Plan

3.1 General

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all IC/ECs on the site.
- The basic implementation and intended role of each IC/EC.
- A description of the key components of the ICs set forth in the Environmental Easement.
- A description of the controls to be evaluated during each required inspection and periodic review.
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in **Appendix E**) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site.
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC project manager.

3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the site to restricted residential uses only. Adherence to these ICs on the site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on **Figure 2**. These ICs are:

- Require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3).

- Allow the use and development of the controlled property for restricted residential use as defined by Part 375-1.8(g), although land use is subject to local zoning laws.
- Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or NYCDOHMH.
- Require compliance with the Department approved Site Management Plan.

3.3 Engineering Controls

3.3.1 Monitoring Wells Associated with In-Situ Chemical Oxidation

A network of four monitoring wells was constructed to monitor the effectiveness of the ISCO remedy. The objective of this EC is to monitor groundwater quality until sample analytical results are below AWQS or asymptotic levels are reached.

The monitoring wells are located immediately outside the Site boundaries on the upgradient and downgradient sides. The upgradient wells are designated MW-P1 and MW-P2 and are located within the sidewalk along 30th Street. The downgradient wells are designated MW-P3 and MW-P4 and are located in a soil covered area within the alley known as Old Ridge Road. **Figure 7** shows the location of the EC monitoring well network for the site.

The monitoring well network was installed on November 17, 2020. Monitoring well construction logs are included in **Appendix D**.

All wells are screened at the water table, from 25- to 35-ft. bgs. The screened interval is the same as for the shallow temporary wells installed during the RI, in which most COC exceedances were detected. It is also the interval where ISCO injections were applied. The wells are constructed of two-inch diameter schedule 40 PVC with 0.020-inch slotted screen. Each well is capped with a J-plug and covered with a five-inch diameter flush mounted steel manhole cover.

Quarterly groundwater monitoring of the well network commenced in December 2020 with collection of baseline samples prior to ISCO implementation. The ISCO Work Plan was implemented from December 2020 through January 2021. The first post-ISCO samples were collected in March 2021. Samples will be collected quarterly from the monitoring well network as described in the Monitoring and Sampling Plan in Section 4.0 of this SMP.

Procedures for operating and maintaining the monitoring wells associated with ISCO are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP).

3.3.2 Sub-Slab Depressurization System (SSDS)

A sub-slab depressurization system (SSDS) was constructed in each of the two on-Site buildings during redevelopment. The purpose of the SSDS is to mitigate potential soil vapor intrusion (SVI) by inducing a vacuum, i.e., negative pressure, below the building slabs.

The SSDS consists of the following components installed within each of the two newly constructed on-Site buildings: a network of perforated sub-slab piping, a vapor barrier, a riser pipe terminating at the roof, inline vapor mitigation fans, and a network of permanent vapor monitoring points. The SSDS, as designed, provides active depressurization, which can be made passive by the removing or shutting down of in-line vapor mitigation fans.

The permanent vapor monitoring points will be used to monitor SSDS performance by taking vacuum measurements with a digital manometer. The monitoring points may also be used to sample sub-slab soil vapor.

The sub-slab piping networks were designed to induce vacuum below all tenant storage spaces and mechanical rooms located in the cellars of both buildings. **Figure 8** shows the area serviced by the SSDS, as-built sub-slab piping layouts and locations of vapor monitoring points. The network of on-site soil vapor intrusion sample locations has been designed based on the following criteria:

- Four permanent vapor monitoring points were installed in each building, throughout the area of the building serviced by the SSDS;
- All vapor monitoring points extend approximately 24-inches below the top of the cellar slab.

3.3.3 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10. Unless waived by the NYSDEC,

confirmation samples of applicable environmental media are required before terminating any remedial actions at the site. Confirmation samples require Category B deliverables and a Data Usability Summary Report (DUSR).

As discussed below, the NYSDEC may approve termination of a groundwater monitoring program. When a remedial party receives this approval, the remedial party will decommission all site-related monitoring, injection and recovery wells as per the NYSDEC CP-43 policy.

The remedial party will also conduct any needed site restoration activities, such as asphalt patching and decommissioning treatment system equipment. In addition, the remedial party will conduct any necessary restoration of vegetation coverage, trees and wetlands, and will comply with NYSDEC and United States Army Corps of Engineers regulations and guidance. Also, the remedial party will ensure that no ongoing erosion is occurring on the site.

3.3.3.1 Monitoring Wells associated with In-Situ Chemical Oxidation

Groundwater monitoring activities to assess ISCO will continue, as determined by the NYSDEC project manager in consultation with NYSDOH project manager, until residual groundwater concentrations are found to be consistently below ambient water quality standards or the site SCGs or have become asymptotic at an acceptable level over an extended period. If monitoring data indicates that monitoring may no longer be required, a proposal to discontinue the remedy will be submitted by the remedial party. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC project manager. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional injections, source removal, treatment and/or control measures will be evaluated.

3.3.3.2 Sub-Slab Depressurization System (SSDS)

Operation of the active SSDS will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH project managers. If monitoring data indicates that the SSDS may no longer be required, a proposal to discontinue the SSDS will be submitted by the remedial party to the NYSDEC and NYSDOH project managers.

4.0 Monitoring and Sampling Plan

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC project manager. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Quality Assurance Project Plan provided in **Appendix F**.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils).
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater standards and Part 375 SCOs for soil.
- Monitoring for soil vapor intrusion for any new building constructed at the Site.
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol, and frequency
- Information on all designed monitoring systems
- Analytical sampling program requirements
- Inspection and maintenance requirements for monitoring wells
- Monitoring well decommissioning procedures
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP. All on-Site work conducted under this Monitoring and Sampling Plan shall be performed in accordance with the Site-specific Health and Safety Plan included in **Appendix G**.

4.2 Site-wide Inspection

Site-wide inspections will be performed at a minimum of once per year. These periodic inspections must be conducted when the ground surface is visible (i.e. no snow cover). Site-wide inspections will be performed by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the NYSDEC project manager. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in **Appendix H** – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage.
- An evaluation of the condition and continued effectiveness of ECs.
- General site conditions at the time of the inspection.
- Whether stormwater management systems, such as basins and outfalls, are working as designed.
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection.
- Confirm that site records are up to date.

Inspections of all remedial components installed at the site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed.
- If these controls continue to be protective of human health and the environment.
- Compliance with requirements of this SMP and the Environmental Easement.
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC project manager must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as defined in 6 NYCCR Part 375. Written confirmation must be provided to the NYSDEC project manager within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Treatment System Monitoring and Sampling

4.3.1 Remedial System Monitoring

Monitoring of the SSDS will be performed on a routine basis, as identified in **Table 5** – Remedial System Monitoring Requirements and Schedule (see below). The monitoring of remedial systems must be conducted by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSDS system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SSDS components to be monitored include, but are not limited to, the components listed below.

Table 5 – Remedial System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Vapor Monitoring Point Network (VMP-1 through VMP-8)	Vacuum (pressure)	-0.02 inches H_2O	To Be Determined
In-line Vent Fans	Flow Rate	To Be Determined	To Be Determined

The operating ranges and monitoring schedules for the above remedial system components will be determined following SSDS pilot testing and fan selection, installation, and startup.

A complete list of components to be inspected is provided in the Inspection Checklist, provided in **Appendix H** - Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.4 Post-Remediation Media Monitoring and Sampling

4.4.1 Groundwater Sampling

Groundwater monitoring will be performed quarterly to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

The network of monitoring wells has been installed to monitor upgradient and downgradient groundwater conditions at the site. The network of on-site wells has been designed based on the following criteria:

- Two monitoring wells are located immediately upgradient of the Site;
- Two monitoring wells are located immediately downgradient of the Site;
- All monitoring wells are screened at the water table.

All wells are screened at the water table, from 25- to 35-ft. bgs. The screened interval is the same as for the shallow temporary wells installed during the RI, in which

most COC exceedances were detected. It is also the interval where ISCO injections were applied. The wells are constructed of two-inch diameter schedule 40 PVC with 0.020-inch slotted screen. Each well is capped with a J-plug and covered with a five-inch diameter flush mounted steel manhole cover.

Table 6 below summarizes the well identification number, as well as the purpose, location, depths, diameter and screened intervals of the wells. As part of the groundwater monitoring, two upgradient wells and two downgradient wells are sampled to evaluate the effectiveness of the remedial system. The remedial party will measure depth to the water table for each monitoring well in the network before sampling.

Table 6–Monitoring Well Construction Details

Monitoring Well ID	Well Location	Coordinates (longitude/ latitude)	Well Diameter (inches)	Elevation (NAVD 88)		
				Casing	Screen Top	Screen Bottom
MW-P1	Upgradient	40°45'16.30"N 73°55'57.43"W	2	39.87	14.87	4.87
MW-P2	Upgradient	40°45'17.00"N 73°55'56.85"W	2	40.85	15.85	5.85
MW-P3	Downgradient	40°45'17.07"N 73°55'59.18"W	2	44.69	19.69	9.69
MW-P4	Downgradient	40°45'17.81"N 73°55'58.19"W	2	45.0	20.0	10.0

Monitoring well construction logs are included in Appendix D of this SMP.

Samples shall be collected from the groundwater on a routine basis. Sampling locations required analytical parameters and schedule are provided in the Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Post Remediation Sampling Requirements and Schedule

Sampling Location	Analytical Parameters	Schedule
	VOCs (EPA Method 8260D)	
MW-P1	X	Quarterly
MW-P2	X	Quarterly
MW-P3	X	Quarterly
MW-P4	X	Quarterly

Detailed sample collection and analytical procedures and protocols are provided in **Appendix F** – Quality Assurance Project Plan.

If biofouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC project manager will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC project manager. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC project manager.

The sampling frequency may only be modified with the approval of the NYSDEC project manager. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC project manager.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.4.2 Post-Mitigation Indoor Air Sampling

Post-mitigation indoor air sampling will be performed no sooner than 30 days following the startup of the SSDS, within the heating season, to confirm the effectiveness of the system. If the system is installed outside of the heating season, post-mitigation air sampling will be required prior to occupancy and based on the results may need to be repeated the following heating season. Three indoor air samples will be collected from the basement of each building in the area serviced by the active SSDS. These indoor air samples will be collected via 6-liter SUMMA canisters set to fill over a 24-hour time period and analyzed for chlorinated VOCs via EPA Method TO-15. **Figure 9** depicts the locations of the proposed post-mitigation air samples. A chemical inventory will be conducted at the time of sampling to determine if any stored chemicals have the potential to impact sampling results. The locations of these samples will be determined based upon field conditions. An ambient air sample will be also collected in a similar manner for comparison purposes.

The sampling frequency may only be modified with the approval of the NYSDEC project manager. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC project manager.

Deliverables for the post mitigation indoor air sampling program are specified in Section 7.0 – Reporting Requirements.

4.4.3 Post-Mitigation SVI Evaluation

The sub-grade parking areas on the west side of both buildings were excluded from the areas serviced by the SSDS, because these areas will be constructed with high-volume air exchange systems, which are to be operated continuously. An SVI evaluation will be conducted in these areas to determine whether mitigation is required. The SVI evaluation will consist of collecting one indoor air sample and one collocated sub-slab soil vapor sample from the cellar parking area of each building. Penetrations of the vapor barrier for the purpose of collecting sub-slab samples will be repaired in accordance with the vapor barrier material manufacturer. An outdoor ambient air sample will also be collected. If the results indicate that mitigation is required, then the high-volume air exchange systems will be evaluated for their effectiveness and alternate means of mitigation and/or monitoring will be discussed with NYSDEC and NYSDOH.

4.4.4 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in **Appendix H** - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Quality Assurance Project Plan provided as **Appendix F** of this document.

5.0 Operation and Maintenance Plan

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the sub-slab-depressurization system (SSDS);
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS is operated and maintained.

5.2 Sub-Slab Depressurization System Performance Criteria

A pilot test of the SSDS piping and vapor monitoring points will be conducted to complete the design of the SSDS and determine system performance criteria. The pilot test will be scheduled in coordination with the construction schedule so that the SSDS will be installed and operational prior to building occupancy. The purpose of the pilot test is to determine the necessary fan power and speed required to induce the required vacuum at all eight vapor monitoring points, i.e. VMP-1 through VMP-8, and to determine whether any treatment of the vapor-phase effluent may be required prior to discharge.

The pilot test will be performed by a subcontractor of GEI. The pilot test procedure will consist of connecting a portable blower to the SSDS piping where it penetrates the slab, taking vacuum measurements at all monitoring points at a range of blower speeds, and collecting an effluent vapor sample from each of the two buildings for analysis by EPA Method TO-15 at a NYSDEC Environmental Laboratory Accreditation Program certified laboratory. All vacuum measurements will be made using a Dwyer Series 477AV handheld digital manometer or equivalent. The vapor stream velocity will be measured at each pilot test blower speed using a TSI VelociCalc ventilation meter or equivalent inserted through a perforation in the hose/pipe connecting the blower to the sub-slab piping. Prior to pilot testing, all vapor monitoring points will be seal checked using a helium leak test procedure to ensure the validity of vacuum measurements.

The in-line ventilation fans will be operated at speeds sufficient to induce a continuous minimum vacuum of -0.02 inches H_2O at all vapor monitoring points.

Following completion of the pilot test, this section will be revised to specify the in-line fan selection, the design flow rate, and any applicable vapor-phase effluent discharge requirements.

5.3 Operation and Maintenance of Sub-slab Depressurization System

Following SSDS pilot testing, the following sections will be revised to provide a description of the operations and maintenance of the SSDS. Cut-sheets and as-built drawings for the SSDS will be provided in an appendix entitled Operations and Maintenance Manual.

5.3.1 System Start-Up and Testing

This section will include a description of, as appropriate:

- Manufacturer's recommendations
- Pre start-up inspection
- Baseline measurements
- Testing methods:
    - Checks for leaks
    - Checks of seals
    - Check of backdrafts
    - Pressure tests
    - System balancing
    - Warning devices
    - Sampling.

The system testing described above will be conducted if, in the course of the SSDS system lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

5.3.2 Routine System Operation and Maintenance

This section will include a description of:

- Manufacturer's recommendations
- Troubleshooting guide
- Adjustment and repairs
- Operation schedule
- Inspections

- Routine maintenance activities and minimum schedules.

A summary and schedule of routine maintenance will be provided in table form.

5.3.3 Non-Routine Operation and Maintenance

This section will include a description of:

- Warning devices initiated
- Damage
- Reduced effectiveness
- System or component replacement.

5.3.4 System Monitoring Devices and Alarms

The SSDS will have a warning device to indicate that the system is not operating properly. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSDS will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

6.0 Periodic Assessments/Evaluations

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section briefly summarizes the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding.

The Site is not located within any State or Federal flood plains. Erosion is not a concern, as the entire Site footprint is covered by buildings. No part of the Site is susceptible to damage due to high wind conditions. Flooding is unlikely, as the on-Site buildings are equipped with stormwater detention basins. Because the SSDS is activated by an electric in-line ventilation fan, SSDS operation will be susceptible to disruption due to electrical power outage. There is no potential for a spill or contaminant release due to climate related events.

6.2 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC project manager or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document.
- The management and operation of the remedial system is exceeding the estimated costs.
- The remedial system is not performing as expected or as designed.
- Previously unidentified source material may be suspected.

- Plume shift has potentially occurred.
- Site conditions change due to development, change of use, change in groundwater use, etc.
- There is an anticipated transfer of the site management to another remedial party or agency.
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

7.0. Reporting Requirements

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in **Appendix H**. These forms are subject to NYSDEC revision. All site management inspection, maintenance, and monitoring events will be conducted by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of **Table 7** and summarized in the Periodic Review Report.

Table 7: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Groundwater Monitoring Report	Quarterly
Periodic Review Report	Annually, or as otherwise determined by the NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period.
- Name, company, and position of person(s) conducting monitoring/inspection activities.
- Description of the activities performed.
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet).
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air).
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation).

- Sampling results in comparison to appropriate standards/criteria.
- A figure illustrating sample type and sampling locations.
- Copies of all laboratory data sheets, and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format).
- Any observations, conclusions, or recommendations.
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event
- Name, company, and position of person(s) conducting maintenance activities
- Description of maintenance activities performed
- Any modifications to the system
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet).
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities
- Description of non-routine activities performed
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet)
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuISTM database in accordance with the requirements found at this link:
http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the NYSDEC project manager beginning 16 months after the Certificate of Completion is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the NYSDEC project manager or at another frequency as may be required by the NYSDEC project manager. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in **Appendix A** - Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections, fire inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- Identification of any wastes generated during the reporting period, along with waste characterization data, manifests, and disposal documentation.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These tables and figures will include a presentation of past data as part of an evaluation of contaminant concentration trends, including but not limited to:
    - Trend monitoring graphs that present groundwater contaminant levels from before the start of the remedy implementation to the most current sampling data.
    - Trend monitoring graphs depicting system influent analytical data on a per event and cumulative basis.
    - O&M data summary tables.
    - A current plume map for sites with remaining groundwater contamination.

- A groundwater elevation contour map for each gauging event.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan (RAWP), ROD or Decision Document;
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
  - An evaluation of trends in contaminant levels in the affected media to determine if the remedy continues to be effective in achieving remedial goals as specified by the RAWP, ROD or Decision Document; and
  - The overall performance and effectiveness of the remedy.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice and registered in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional or engineering control identified for the site, I certify that all of the following statements are true:*

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*

- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*

- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*

- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Gary A. Rozmus, of 1000 New York Ave, Suite B, Huntington Station, New York, am certifying as Owner's/Remedial Party's Designated Site Representative for the site."

"I certify that the New York State Education Department has granted a Certificate of Authorization to provide Professional Engineering services to the firm that prepared this Periodic Review Report."

Every five years the following certification will be added:

- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager. The Periodic Review Report may also need to be submitted in hard-copy format if requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control or failure to conduct site management activities, a Corrective Measures Work Plan will be submitted to the NYSDEC project manager for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

7.4 Remedial Site Optimization Report

If an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the NYSDEC project manager for approval. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager.

8.0 REFERENCES

Athenica Environmental Services, Inc., June 13, 2017. Phase II Subsurface Investigation Report.

GEI Consultants, Inc., January 2020. Remedial Investigation Report.

GEI Consultants, Inc., December 2020. Remedial Action Work Plan.

GEI Consultants, Inc., May 2021. Final Engineering Report.

GTA Engineering Services of New York, P.C., November 2018. Report of Geotechnical Exploration.

Hillmann Consulting, April 13, 2017. Phase I Environmental Site Assessment.

6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

TABLES

Table 1. Confirmation End-Point Soil Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

Sample Name				SW-1		SW-2		SW-3		DUP20201113		SW-4		SW-5		SW-6		SW-7	
Sample Date				12/4/2020		11/13/2020		11/13/2020		11/13/2020		12/4/2020		12/4/2020		12/10/2020		1/11/2021	
Parent Sample										SW-3									
Analyte	**Units**	**CAS No.**	**NY_6 NYCRR 375 SCO UNRESTRICTED USE**																
Volatile Organic Compounds	mg/Kg																		
1,1,1-Trichloroethane		71-55-6	0.68	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,1,2,2-Tetrachloroethane		79-34-5	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,1,2-Trichloroethane		79-00-5	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,1-Dichloroethane		75-34-3	0.27	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,1-Dichloroethene		75-35-4	0.33	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,2,3-Trichlorobenzene		87-61-6	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,2,4-Trichlorobenzene		120-82-1	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,2-Dibromo-3-Chloropropane		96-12-8	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,2-Dichlorobenzene		95-50-1	1.1	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,2-Dichloroethane		107-06-2	0.02	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,2-Dichloropropane		78-87-5	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,3-Dichlorobenzene		541-73-1	2.4	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,4-Dichlorobenzene		106-46-7	1.8	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
1,4-Dioxane		123-91-1	0.1	0.022	U	0.022	U	0.024	U	0.023	U	0.022	U	0.022	U	0.022	U	0.026	U
2-Butanone (MEK)		78-93-3	0.12	0.0056	U	0.0054	U	0.0061	U	0.0057	U	0.0054	U	0.0055	U	0.0056	U	0.0066	U
2-Hexanone		591-78-6	NE	0.0056	U	0.0054	U	0.0061	U	0.0057	U	0.0054	U	0.0055	U	0.0056	U	0.0066	U
4-Methyl-2-pentanone (MIBK)		108-10-1	NE	0.0056	U	0.0054	U	0.0061	U	0.0057	U	0.0054	U	0.0055	U	0.0056	U	0.0066	U
Acetone		67-64-1	0.05	0.0067	U	0.0065	U	0.0073	U	0.0069	U	0.0065	U	0.0066	U	0.0067	U	0.0079	U
Benzene		71-43-2	0.06	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Bromoform		75-25-2	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Bromomethane		74-83-9	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0026	U
Carbon disulfide		75-15-0	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Carbon tetrachloride		56-23-5	0.76	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Chlorobenzene		108-90-7	1.1	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Chlorobromomethane		74-97-5	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Chlorodibromomethane		124-48-1	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Chloroethane		75-00-3	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Chloroform		67-66-3	0.37	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Chloromethane		74-87-3	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
cis-1,2-Dichloroethene		156-59-2	0.25	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
cis-1,3-Dichloropropene		10061-01-5	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Cyclohexane		110-82-7	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Dichlorobromomethane		75-27-4	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Dichlorodifluoromethane		75-71-8	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Ethylbenzene		100-41-4	1	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Ethylene Dibromide		106-93-4	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Isopropylbenzene		98-82-8	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Methyl acetate		79-20-9	NE	0.0056	U	0.0054	U	0.0061	U	0.0057	U	0.0054	U	0.0055	U	0.0056	U	0.0066	U
Methyl tert-butyl ether		1634-04-4	0.93	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Methylcyclohexane		108-87-2	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Methylene Chloride		75-09-2	0.05	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0026	U
m-Xylene & p-Xylene		179601-23-1	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
o-Xylene		95-47-6	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Styrene		100-42-5	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Tetrachloroethene		127-18-4	1.3	0.0011	U	0.0011	U	**0.0035**		**0.0044**		**0.0017**		0.0011	U	**0.00044**	**J**	0.0013	U
Toluene		108-88-3	0.7	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
trans-1,2-Dichloroethene		156-60-5	0.19	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
trans-1,3-Dichloropropene		10061-02-6	NE	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Trichloroethene		79-01-6	0.47	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Trichlorofluoromethane		75-69-4	NE	0.0011	U *	0.0011	U	0.0012	U	0.0011	U	0.0011	U *	0.0011	U *	0.0011	U	0.0013	U
Vinyl chloride		75-01-4	0.02	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U
Total VOCs		NE	NE	0.0		0.0		**0.0035**		**0.0044**		**0.0017**		0.0		**0.00044**		0.0	
Total Estimated TICs		NE	NE	0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T	

Notes:

mg/kg = milligrams/kilogram or parts per million (ppm)
TICs = Tentatively Identified Compounds
6 NYCRR = New York State Register and Official Compilation of Codes, Rules and Regulations of the State of New York
Comparison of detected results are performed against the following NYCRR, Chapter IV, Part 375-6 Soil Cleanup Objectives (SCO)s: Unrestricted Use
CAS No. = Chemical Abstracts Service Number
NA = Not Analyzed
NE = Not Established
NYSDEC = New York State Department of Environmental Conservation

Bolding indicates a detected result concentration
Gray shading and bolding indicates that the detected result value exceeds the Unrestricted SCO

Qualifiers:

J = The result is an estimated value.
R = The result is rejected.
U = The result was not detected above the reporting limit.
UJ = The results was not detected at or above the reporting limit shown and the reporting limit is estimated.
* = Laboratory Control Sample is outside acceptance limits
B = Compound was found in the blank and sample.
*T = There are no TICs reported for the sample.

Table 1. Confirmation End-Point Soil Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

Analyte	Units	CAS No.	NY_6 NYCRR 375 SCO UNRESTRICTED USE	Sample Name	SW-8		SW-9		SW-10		SW-X		SW-11		SW-12		SW-13		SW-14		SW-15	
				Sample Date	1/28/2021		2/11/2021		1/11/2021		1/11/2021		12/10/2020		12/4/2020		12/30/2020		12/30/2020		12/30/2020	
				Parent Sample							SW-10											
Volatile Organic Compounds	mg/Kg																					
1,1,1-Trichloroethane		71-55-6	0.68		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,1,2,2-Tetrachloroethane		79-34-5	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,1,2-Trichloroethane		79-00-5	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,1-Dichloroethane		75-34-3	0.27		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,1-Dichloroethene		75-35-4	0.33		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,2,3-Trichlorobenzene		87-61-6	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,2,4-Trichlorobenzene		120-82-1	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,2-Dibromo-3-Chloropropane		96-12-8	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,2-Dichlorobenzene		95-50-1	1.1		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,2-Dichloroethane		107-06-2	0.02		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,2-Dichloropropane		78-87-5	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,3-Dichlorobenzene		541-73-1	2.4		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,4-Dichlorobenzene		106-46-7	1.8		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
1,4-Dioxane		123-91-1	0.1		0.019	U	0.019	U	0.031	U	0.036	U	0.024	U	0.020	U *	0.022	U	0.020	U	0.020	U
2-Butanone (MEK)		78-93-3	0.12		0.0047	U	0.0048	U	0.0077	U	0.0090	U	0.0059	U	0.0051	U	0.0055	U	0.0050	U	0.0049	U
2-Hexanone		591-78-6	NE		0.0047	U	0.0048	U	0.0077	U	0.0090	U	0.0059	U	0.0051	U	0.0055	U	0.0050	U	0.0049	U
4-Methyl-2-pentanone (MIBK)		108-10-1	NE		0.0047	U	0.0048	U	0.0077	U	0.0090	U	0.0059	U	0.0051	U	0.0055	U	0.0050	U	0.0049	U
Acetone		67-64-1	0.05		**0.021**		**0.025**		0.0093	U	0.011	U	0.0071	U	0.0061	U	0.0066	U	0.0061	U	0.0059	U
Benzene		71-43-2	0.06		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Bromoform		75-25-2	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Bromomethane		74-83-9	NE		0.0019	U *	0.0019	U	0.0031	U	0.0036	U	0.0012	U	0.0010	U	0.0022	U	0.0020	U	0.0020	U
Carbon disulfide		75-15-0	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Carbon tetrachloride		56-23-5	0.76		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Chlorobenzene		108-90-7	1.1		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Chlorobromomethane		74-97-5	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Chlorodibromomethane		124-48-1	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Chloroethane		75-00-3	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Chloroform		67-66-3	0.37		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Chloromethane		74-87-3	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
cis-1,2-Dichloroethene		156-59-2	0.25		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
cis-1,3-Dichloropropene		10061-01-5	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Cyclohexane		110-82-7	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Dichlorobromomethane		75-27-4	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Dichlorodifluoromethane		75-71-8	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Ethylbenzene		100-41-4	1		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Ethylene Dibromide		106-93-4	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Isopropylbenzene		98-82-8	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Methyl acetate		79-20-9	NE		0.0047	U	0.0048	U	0.0077	U	0.0090	U	0.0059	U	0.0051	U	0.0055	U	0.0050	U	0.0049	U
Methyl tert-butyl ether		1634-04-4	0.93		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Methylcyclohexane		108-87-2	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U *	0.0011	U	0.0010	U	0.00098	U
Methylene Chloride		75-09-2	0.05		0.0019	U	0.0019	U	0.0031	U	0.0036	U	0.0012	U	0.0010	U	0.0022	U	0.0020	U	0.0020	U
m-Xylene & p-Xylene		179601-23-1	NE		**0.00028**	**J B**	0.00095	U	0.0015	U	0.0018	U	0.0012	U	**0.00019**	**J**	0.0011	U	**0.00069**	**J**	0.00098	U
o-Xylene		95-47-6	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Styrene		100-42-5	NE		0.00095	U	**0.00030**	**J**	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Tetrachloroethene		127-18-4	1.3		**0.0005**	**J**	**0.0011**		0.0015	U	0.0018	U	**0.00077**	**J**	**0.00048**	**J ***	**0.00078**	**J**	**0.0020**		**0.0015**	
Toluene		108-88-3	0.7		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	**0.00043**	**J**	0.00098	U
trans-1,2-Dichloroethene		156-60-5	0.19		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
trans-1,3-Dichloropropene		10061-02-6	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Trichloroethene		79-01-6	0.47		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Trichlorofluoromethane		75-69-4	NE		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Vinyl chloride		75-01-4	0.02		0.00095	U	0.00095	U	0.0015	U	0.0018	U	0.0012	U	0.0010	U	0.0011	U	0.0010	U	0.00098	U
Total VOCs		NE	NE		**0.02178**		**0.0264**		0.0		0.0		**0.00077**		**0.00067**		**0.00078**		**0.00312**		**0.0015**	
Total Estimated TICs		NE	NE		**0.0058**		**0.0058**		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		**0.0059**	

Notes:

mg/kg = milligrams/kilogram or parts per million (ppm)
TICs = Tentatively Identified Compounds
6 NYCRR = New York State Register and Official Compilation of Codes, Rules and Regulations of the St
Comparison of detected results are performed against the following NYCRR, Chapter IV, Part 375-6 Soil
CAS No. = Chemical Abstracts Service Number
NA = Not Analyzed
NE = Not Established
NYSDEC = New York State Department of Environmental Conservation

Bolding indicates a detected result concentration
Gray shading and bolding indicates that the detected result value exceeds the Unrestricted SCO

Qualifiers:

J = The result is an estimated value.
R = The result is rejected.
U = The result was not detected above the reporting limit.
UJ = The results was not detected at or above the reporting limit shown and the reporting limit is estimate
* = Laboratory Control Sample is outside acceptance limits
B = Compound was found in the blank and sample.
*T = There are no TICs reported for the sample.

Table 1. Confirmation End-Point Soil Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

Sample Name				SW-16		SW-17		EP-1		EP-2		EP-3		EP-4		EP-5		EP-6	
Sample Date				12/30/2020		12/30/2020		12/28/2020		12/28/2020		2/11/2021		2/11/2021		12/28/2020		12/30/2020	
Parent Sample																			
Analyte	**Units**	**CAS No.**	**NY_6 NYCRR 375 SCO UNRESTRICTED USE**																
Volatile Organic Compounds	mg/Kg																		
1,1,1-Trichloroethane		71-55-6	0.68	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,1,2,2-Tetrachloroethane		79-34-5	NE	0.00095	U	0.0011	U	0.0011	U *	0.0012	U *	0.00096	U	0.00094	U	0.0010	U *	0.0012	U
1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,1,2-Trichloroethane		79-00-5	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,1-Dichloroethane		75-34-3	0.27	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,1-Dichloroethene		75-35-4	0.33	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,2,3-Trichlorobenzene		87-61-6	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,2,4-Trichlorobenzene		120-82-1	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,2-Dibromo-3-Chloropropane		96-12-8	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,2-Dichlorobenzene		95-50-1	1.1	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,2-Dichloroethane		107-06-2	0.02	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,2-Dichloropropane		78-87-5	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,3-Dichlorobenzene		541-73-1	2.4	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,4-Dichlorobenzene		106-46-7	1.8	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
1,4-Dioxane		123-91-1	0.1	0.019	U	0.023	U	0.022	U	0.023	U	0.019	U	0.019	U	0.021	U	0.023	U
2-Butanone (MEK)		78-93-3	0.12	0.0048	U	0.0056	U	0.0054	U	0.0058	U	0.0048	U	0.0047	U	0.0051	U	0.0059	U
2-Hexanone		591-78-6	NE	0.0048	U	0.0056	U	0.0054	U	0.0058	U	0.0048	U	0.0047	U	0.0051	U	0.0059	U
4-Methyl-2-pentanone (MIBK)		108-10-1	NE	0.0048	U	0.0056	U	0.0054	U	0.0058	U	0.0048	U	0.0047	U	0.0051	U	0.0059	U
Acetone		67-64-1	0.05	0.0057	U	0.0068	U	0.0065	U	0.0069	U	**0.016**		**0.016**		0.0062	U	**0.0090**	
Benzene		71-43-2	0.06	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Bromoform		75-25-2	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Bromomethane		74-83-9	NE	0.0019	U	0.0023	U	0.0022	U	0.0023	U	0.0019	U	0.0019	U	0.0021	U	0.0023	U
Carbon disulfide		75-15-0	NE	0.00095	U	0.0011	U	0.0011	U *	0.0012	U *	0.00096	U	0.00094	U	0.0010	U *	0.0012	U
Carbon tetrachloride		56-23-5	0.76	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Chlorobenzene		108-90-7	1.1	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Chlorobromomethane		74-97-5	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Chlorodibromomethane		124-48-1	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Chloroethane		75-00-3	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Chloroform		67-66-3	0.37	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Chloromethane		74-87-3	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
cis-1,2-Dichloroethene		156-59-2	0.25	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
cis-1,3-Dichloropropene		10061-01-5	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Cyclohexane		110-82-7	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Dichlorobromomethane		75-27-4	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Dichlorodifluoromethane		75-71-8	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Ethylbenzene		100-41-4	1	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Ethylene Dibromide		106-93-4	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Isopropylbenzene		98-82-8	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Methyl acetate		79-20-9	NE	0.0048	U	0.0056	U	0.0054	U *	0.0058	U *	0.0048	U	0.0047	U	0.0051	U *	0.0059	U
Methyl tert-butyl ether		1634-04-4	0.93	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Methylcyclohexane		108-87-2	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Methylene Chloride		75-09-2	0.05	0.0019	U	0.0023	U	0.0022	U	0.0023	U	0.0019	U	0.0019	U	0.0021	U	0.0023	U
m-Xylene & p-Xylene		179601-23-1	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
o-Xylene		95-47-6	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Styrene		100-42-5	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Tetrachloroethene		127-18-4	1.3	**0.0034**		**0.0033**		0.0011	U	**0.00086**	**J**	**0.00081**	**J**	**0.0046**		0.0010	U	**0.0013**	
Toluene		108-88-3	0.7	0.00095	U	0.0011	U	0.0011	U	**0.00059**	**J**	0.00096	U	0.00094	U	0.0010	U	0.0012	U
trans-1,2-Dichloroethene		156-60-5	0.19	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
trans-1,3-Dichloropropene		10061-02-6	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Trichloroethene		79-01-6	0.47	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00030	J	0.0010	U	0.0012	U
Trichlorofluoromethane		75-69-4	NE	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Vinyl chloride		75-01-4	0.02	0.00095	U	0.0011	U	0.0011	U	0.0012	U	0.00096	U	0.00094	U	0.0010	U	0.0012	U
Total VOCs		NE	NE	**0.0034**		**0.0033**		0.0		**0.00145**		**0.01681**		**0.0209**		0.0		**0.0103**	
Total Estimated TICs		NE	NE	0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T	

Notes:
mg/kg = milligrams/kilogram or parts per million (ppm)
TICs = Tentatively Identified Compounds
6 NYCRR = New York State Register and Official Compilation of Codes, Rules and Regulations of the St
Comparison of detected results are performed against the following NYCRR, Chapter IV, Part 375-6 Soil
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NA = Not Analyzed
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Bolding indicates a detected result concentration
Gray shading and bolding indicates that the detected result value exceeds the Unrestricted SCO

Qualifiers:
J = The result is an estimated value.
R = The result is rejected.
U = The result was not detected above the reporting limit.
UJ = The results was not detected at or above the reporting limit shown and the reporting limit is estimate
* = Laboratory Control Sample is outside acceptance limits
B = Compound was found in the blank and sample.
*T = There are no TICs reported for the sample.

Table 1. Confirmation End-Point Soil Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

Sample Name				EP-7		EP-8		EP-9		EP-10		EP-11		EP-12		EP-13	
Sample Date				12/28/2020		2/11/2021		2/11/2021		12/30/2020		12/28/2020		2/11/2021		2/11/2021	
Parent Sample																	
Analyte	**Units**	**CAS No.**	**NY_6 NYCRR 375 SCO UNRESTRICTED USE**														
Volatile Organic Compounds	mg/Kg																
1,1,1-Trichloroethane		71-55-6	0.68	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,1,2,2-Tetrachloroethane		79-34-5	NE	0.0010	U *	0.0012	U	0.0011	U	0.00098	U	0.0011	U *	0.00098	U	0.0010	U
1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,1,2-Trichloroethane		79-00-5	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,1-Dichloroethane		75-34-3	0.27	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,1-Dichloroethene		75-35-4	0.33	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,2,3-Trichlorobenzene		87-61-6	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,2,4-Trichlorobenzene		120-82-1	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,2-Dibromo-3-Chloropropane		96-12-8	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,2-Dichlorobenzene		95-50-1	1.1	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,2-Dichloroethane		107-06-2	0.02	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,2-Dichloropropane		78-87-5	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,3-Dichlorobenzene		541-73-1	2.4	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,4-Dichlorobenzene		106-46-7	1.8	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
1,4-Dioxane		123-91-1	0.1	0.021	U	0.023	U	0.022	U	0.020	U	0.021	U	0.020	U	0.021	U
2-Butanone (MEK)		78-93-3	0.12	0.0051	U	0.0058	U	0.0055	U	0.0049	U	0.0053	U	0.0049	U	0.0052	U
2-Hexanone		591-78-6	NE	0.0051	U	0.0058	U	0.0055	U	0.0049	U	0.0053	U	0.0049	U	0.0052	U
4-Methyl-2-pentanone (MIBK)		108-10-1	NE	0.0051	U	0.0058	U	0.0055	U	0.0049	U	0.0053	U	0.0049	U	0.0052	U
Acetone		67-64-1	0.05	0.0062	U	**0.011**		**0.014**		**0.020**		0.0063	U	**0.018**		**0.023**	
Benzene		71-43-2	0.06	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Bromoform		75-25-2	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Bromomethane		74-83-9	NE	0.0021	U	0.0023	U	0.0022	U	0.0020	U	0.0021	U	0.0020	U	0.0021	U
Carbon disulfide		75-15-0	NE	0.0010	U *	0.0012	U	0.0011	U	0.00098	U	0.0011	U *	0.00098	U	0.0010	U
Carbon tetrachloride		56-23-5	0.76	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Chlorobenzene		108-90-7	1.1	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Chlorobromomethane		74-97-5	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Chlorodibromomethane		124-48-1	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Chloroethane		75-00-3	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Chloroform		67-66-3	0.37	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Chloromethane		74-87-3	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
cis-1,2-Dichloroethene		156-59-2	0.25	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
cis-1,3-Dichloropropene		10061-01-5	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Cyclohexane		110-82-7	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Dichlorobromomethane		75-27-4	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Dichlorodifluoromethane		75-71-8	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Ethylbenzene		100-41-4	1	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	**0.00022**	**J**	0.0010	U
Ethylene Dibromide		106-93-4	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Isopropylbenzene		98-82-8	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Methyl acetate		79-20-9	NE	0.0051	U *	0.0058	U	0.0055	U	0.0049	U	0.0053	U *	0.0049	U	0.0052	U
Methyl tert-butyl ether		1634-04-4	0.93	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Methylcyclohexane		108-87-2	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Methylene Chloride		75-09-2	0.05	0.0021	U	0.0023	U	0.0022	U	0.0020	U	0.0021	U	0.0020	U	0.0021	U
m-Xylene & p-Xylene		179601-23-1	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	**0.00069**	**J**	0.0010	U
o-Xylene		95-47-6	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	**0.00036**	**J**	0.0010	U
Styrene		100-42-5	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Tetrachloroethene		127-18-4	1.3	**0.00089**	**J**	**0.00057**	**J**	**0.00038**	**J**	**0.0025**		**0.0010**	**J**	**0.00073**	**J**	0.0010	U
Toluene		108-88-3	0.7	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	**0.00071**	**J**	0.0010	U
trans-1,2-Dichloroethene		156-60-5	0.19	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
trans-1,3-Dichloropropene		10061-02-6	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Trichloroethene		79-01-6	0.47	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Trichlorofluoromethane		75-69-4	NE	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Vinyl chloride		75-01-4	0.02	0.0010	U	0.0012	U	0.0011	U	0.00098	U	0.0011	U	0.00098	U	0.0010	U
Total VOCs		NE	NE	**0.00089**		**0.01157**		**0.01438**		**0.0225**		**0.001**		**0.02071**		**0.023**	
Total Estimated TICs		NE	NE	0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T		0.0*T	

Notes:
mg/kg = milligrams/kilogram or parts per million (ppm)
TICs = Tentatively Identified Compounds
6 NYCRR = New York State Register and Official Compilation of Codes, Rules and Regulations of the St
Comparison of detected results are performed against the following NYCRR, Chapter IV, Part 375-6 Soil
CAS No. = Chemical Abstracts Service Number
NA = Not Analyzed
NE = Not Established
NYSDEC = New York State Department of Environmental Conservation

Bolding indicates a detected result concentration
Gray shading and bolding indicates that the detected result value exceeds the Unrestricted SCO

Qualifiers:
J = The result is an estimated value.
R = The result is rejected.
U = The result was not detected above the reporting limit.
UJ = The results was not detected at or above the reporting limit shown and the reporting limit is estimate
* = Laboratory Control Sample is outside acceptance limits
B = Compound was found in the blank and sample.
*T = There are no TICs reported for the sample.

Table 1. Confirmation End-Point Soil Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	EP-14		EP-15		EP-16		EP-17		EP-18	
			Sample Date	12/28/2020		12/28/2020		12/28/2020		2/11/2021		2/11/2021	
			Parent Sample										
Analyte	**Units**	**CAS No.**	**NY_6 NYCRR 375 SCO UNRESTRICTED USE**										
Volatile Organic Compounds	mg/Kg												
1,1,1-Trichloroethane		71-55-6	0.68	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,1,2,2-Tetrachloroethane		79-34-5	NE	0.0011	U *	0.00097	U *	0.0011	U *	0.0011	U	0.0010	U
1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,1,2-Trichloroethane		79-00-5	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,1-Dichloroethane		75-34-3	0.27	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,1-Dichloroethene		75-35-4	0.33	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,2,3-Trichlorobenzene		87-61-6	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,2,4-Trichlorobenzene		120-82-1	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,2-Dibromo-3-Chloropropane		96-12-8	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,2-Dichlorobenzene		95-50-1	1.1	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,2-Dichloroethane		107-06-2	0.02	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,2-Dichloropropane		78-87-5	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,3-Dichlorobenzene		541-73-1	2.4	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,4-Dichlorobenzene		106-46-7	1.8	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
1,4-Dioxane		123-91-1	0.1	0.021	U	0.019	U	0.023	U	0.023	U	0.020	U
2-Butanone (MEK)		78-93-3	0.12	0.0053	U	**0.0033**	**J**	0.0057	U	0.0056	U	0.0051	U
2-Hexanone		591-78-6	NE	0.0053	U	0.0049	U	0.0057	U	0.0056	U	0.0051	U
4-Methyl-2-pentanone (MIBK)		108-10-1	NE	0.0053	U	0.0049	U	0.0057	U	0.0056	U	0.0051	U
Acetone		67-64-1	0.05	**0.014**		**0.026**		0.0069	U	**0.024**		**0.024**	
Benzene		71-43-2	0.06	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Bromoform		75-25-2	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Bromomethane		74-83-9	NE	0.0021	U	0.0019	U	0.0023	U	0.0023	U	0.0020	U
Carbon disulfide		75-15-0	NE	0.0011	U *	0.00097	U *	0.0011	U *	0.0011	U	0.0010	U
Carbon tetrachloride		56-23-5	0.76	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Chlorobenzene		108-90-7	1.1	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Chlorobromomethane		74-97-5	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Chlorodibromomethane		124-48-1	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Chloroethane		75-00-3	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Chloroform		67-66-3	0.37	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Chloromethane		74-87-3	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
cis-1,2-Dichloroethene		156-59-2	0.25	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
cis-1,3-Dichloropropene		10061-01-5	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Cyclohexane		110-82-7	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Dichlorobromomethane		75-27-4	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Dichlorodifluoromethane		75-71-8	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Ethylbenzene		100-41-4	1	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Ethylene Dibromide		106-93-4	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Isopropylbenzene		98-82-8	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Methyl acetate		79-20-9	NE	0.0053	U *	0.0049	U *	0.0057	U *	0.0056	U	0.0051	U
Methyl tert-butyl ether		1634-04-4	0.93	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Methylcyclohexane		108-87-2	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Methylene Chloride		75-09-2	0.05	0.0021	U	0.0019	U	0.0023	U	0.0023	U	0.0020	U
m-Xylene & p-Xylene		179601-23-1	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
o-Xylene		95-47-6	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Styrene		100-42-5	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Tetrachloroethene		127-18-4	1.3	**0.0037**		**0.0020**		**0.0011**		**0.00047**	**J**	**0.00057**	**J**
Toluene		108-88-3	0.7	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
trans-1,2-Dichloroethene		156-60-5	0.19	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
trans-1,3-Dichloropropene		10061-02-6	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Trichloroethene		79-01-6	0.47	**0.00035**	**J**	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Trichlorofluoromethane		75-69-4	NE	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Vinyl chloride		75-01-4	0.02	0.0011	U	0.00097	U	0.0011	U	0.0011	U	0.0010	U
Total VOCs		NE	NE	**0.01805**		**0.0313**		**0.0011**		**0.02447**		**0.02457**	
Total Estimated TICs		NE	NE	0.0*T		0.0*T		0.0*T		0.0*T		0.0*T	

Notes:

mg/kg = milligrams/kilogram or parts per million (ppm)
TICs = Tentatively Identified Compounds
6 NYCRR = New York State Register and Official Compilation of Codes, Rules and Regulations of the St
Comparison of detected results are performed against the following NYCRR, Chapter IV, Part 375-6 Soil
CAS No. = Chemical Abstracts Service Number
NA = Not Analyzed
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Bolding indicates a detected result concentration
Gray shading and bolding indicates that the detected result value exceeds the Unrestricted SCO

Qualifiers:

J = The result is an estimated value.
R = The result is rejected.
U = The result was not detected above the reporting limit.
UJ = The results was not detected at or above the reporting limit shown and the reporting limit is estimate
* = Laboratory Control Sample is outside acceptance limits
B = Compound was found in the blank and sample.
*T = There are no TICs reported for the sample.

Table 2. Pre-ISCO Groundwater Baseline Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-P2		MW-P3		DUP20201209		MW-P4	
			Sample Date	12/15/2020		12/15/2020		12/9/2020		12/9/2020		12/9/2020	
			Parent Sample							MW-P3			
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Volatile Organic Compounds	ug/L												
1,1,1-Trichloroethane		71-55-6	5	1	U	1	U	1	U	1	U	1	U
1,1,2,2-Tetrachloroethane		79-34-5	5	1	U	1	U	1	U	1	U	1	U
1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	5	1	U	1	U	1	U	1	U	1	U
1,1,2-Trichloroethane		79-00-5	1	1	U	1	U	1	U	1	U	1	U
1,1-Dichloroethane		75-34-3	5	1	U	1	U	1	U	1	U	1	U
1,1-Dichloroethene		75-35-4	5	1	U	1	U	1	U	1	U	1	U
1,2,3-Trichlorobenzene		87-61-6	5	1	U	1	U	1	U	1	U	1	U
1,2,4-Trichlorobenzene		120-82-1	5	1	U	1	U	1	U	1	U	1	U
1,2-Dibromo-3-Chloropropane		96-12-8	0.04	1	U	1	U	1	U	1	U	1	U
1,2-Dichlorobenzene		95-50-1	3	1	U	1	U	1	U	1	U	1	U
1,2-Dichloroethane		107-06-2	0.6	1	U	1	U	1	U	1	U	1	U
1,2-Dichloropropane		78-87-5	1	1	U	1	U	1	U	1	U	1	U
1,3-Dichlorobenzene		541-73-1	3	1	U	1	U	1	U	1	U	1	U
1,4-Dichlorobenzene		106-46-7	3	1	U	1	U	1	U	1	U	1	U
1,4-Dioxane		123-91-1	NE	50	U	50	U	50	U	50	U	50	U
2-Butanone (MEK)		78-93-3	50	5	U	5	U	5	U	5	U	5	U
2-Hexanone		591-78-6	50	5	U	5	U	5	U	5	U	5	U
4-Methyl-2-pentanone (MIBK)		108-10-1	NE	5	U	5	U	5	U	5	U	5	U
Acetone		67-64-1	50	5	U	5	U	5	U	5	U	5	U
Benzene		71-43-2	1	1	U	1	U	1	U	1	U	1	U
Bromoform		75-25-2	50	1	U	1	U	1	U	1	U	1	U
Bromomethane		74-83-9	5	1	U	1	U	1	U	1	U	1	U
Carbon disulfide		75-15-0	NE	1	U	1	U	1	U	1	U	1	U
Carbon tetrachloride		56-23-5	5	1	U	1	U	1	U	1	U	1	U
Chlorobenzene		108-90-7	5	1	U	1	U	1	U	1	U	1	U
Chlorobromomethane		74-97-5	5	1	U	1	U	1	U	1	U	1	U
Chlorodibromomethane		124-48-1	50	1	U	1	U	1	U	1	U	1	U
Chloroethane		75-00-3	5	1	U	1	U	1	U	1	U	1	U
Chloroform		67-66-3	7	**2.2**		1	U	**0.83**	**J**	**0.81**	**J**	**3.8**	
Chloromethane		74-87-3	5	1	U	1	U	1	U	1	U	1	U
cis-1,2-Dichloroethene		156-59-2	5	**1.3**		1	U	1	U	1	U	1	U
cis-1,3-Dichloropropene		10061-01-5	NE	1	U	1	U	1	U	1	U	1	U
Cyclohexane		110-82-7	NE	1	U	1	U	1	U	1	U	1	U
Dichlorobromomethane		75-27-4	50	1	U	1	U	1	U	1	U	1	U
Dichlorodifluoromethane		75-71-8	5	1	U	1	U	1	U	1	U	1	U
Ethylbenzene		100-41-4	5	1	U	1	U	1	U	1	U	1	U
Ethylene Dibromide		106-93-4	0.0006	1	U	1	U	1	U	1	U	1	U
Isopropylbenzene		98-82-8	5	1	U	1	U	1	U	1	U	1	U
Methyl acetate		79-20-9	NE	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Methyl tert-butyl ether		1634-04-4	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Methylcyclohexane		108-87-2	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Methylene Chloride		75-09-2	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
m-Xylene & p-Xylene		179601-23-1	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
o-Xylene		95-47-6	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Styrene		100-42-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Tetrachloroethene		127-18-4	5	**220**		**32**		**110**		**110**		**21**	
Toluene		108-88-3	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
trans-1,2-Dichloroethene		156-60-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
trans-1,3-Dichloropropene		10061-02-6	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Trichloroethene		79-01-6	5	**2.4**		1.0	U	**1.5**		**1.5**		0.34	J
Trichlorofluoromethane		75-69-4	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Vinyl chloride		75-01-4	2	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total VOCs				**225.9**		**32.0**		**112.33**		**112.31**		**25.14**	
Total Estimated TICs				0.0*T		0.0*T		0.0*T		0.0*T		0.0*T	

Table 2. Pre-ISCO Groundwater Baseline Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-P2		MW-P3		DUP20201209		MW-P4	
			Sample Date	12/15/2020		12/15/2020		12/9/2020		12/9/2020		12/9/2020	
			Parent Sample							MW-P3			
Analyte	Units	CAS No.	NYS AWQS										
Semi-Volatile Organic Compounds	ug/L												
1,1'-Biphenyl		92-52-4	5	10	U	10	U	10	U	10	U	10	U
1,2,4,5-Tetrachlorobenzene		95-94-3	5	10	U	10	U	10	U	10	U	10	U
2,2'-oxybis[1-chloropropane]		108-60-1	5	10	U	10	U	10	U	10	U	10	U
2,3,4,6-Tetrachlorophenol		58-90-2	NE	10	U	10	U	10	U	10	U	10	U
2,4,5-Trichlorophenol		95-95-4	NE	10	U	10	U	10	U	10	U	10	U
2,4,6-Trichlorophenol		88-06-2	NE	10	U	10	U	10	U	10	U	10	U
2,4-Dichlorophenol		120-83-2	5	10	U	10	U	10	U	10	U	10	U
2,4-Dimethylphenol		105-67-9	50	10	U	10	U	10	U	10	U	10	U
2,4-Dinitrophenol		51-28-5	10	30	U	30	U	30	U	30	U	30	U
2,4-Dinitrotoluene		121-14-2	5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
2,6-Dinitrotoluene		606-20-2	5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
2-Chloronaphthalene		91-58-7	10	10	U	10	U	10	U	10	U	10	U
2-Chlorophenol		95-57-8	NE	10	U	10	U	10	U	10	U	10	U
2-Methylnaphthalene		91-57-6	NE	10	U	10	U	10	U	10	U	10	U
2-Methylphenol		95-48-7	NE	10	U	10	U	10	U	10	U	10	U
2-Nitroaniline		88-74-4	5	20	U	20	U	20	U	20	U	20	U
2-Nitrophenol		88-75-5	NE	10	U	10	U	10	U	10	U	10	U
3,3'-Dichlorobenzidine		91-94-1	5	20	U	20	U	20	U	20	U	20	U
3-Nitroaniline		99-09-2	5	20	U	20	U	20	U	20	U	20	U
4,6-Dinitro-2-methylphenol		534-52-1	NE	30	U	30	U	30	U	30	U	30	U
4-Bromophenyl phenyl ether		101-55-3	NE	10	U	10	U	10	U	10	U	10	U
4-Chloro-3-methylphenol		59-50-7	NE	10	U	10	U	10	U	10	U	10	U
4-Chloroaniline		106-47-8	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
4-Chlorophenyl phenyl ether		7005-72-3	NE	10	U	10	U	10	U	10	U	10	U
4-Methylphenol		106-44-5	NE	10	U	10	U	10	U	10	U	10	U
4-Nitroaniline		100-01-6	5	20	U	20	U	20	U	20	U	20	U
4-Nitrophenol		100-02-7	NE	30	U	30	U	30	U	30	U	30	U
Acenaphthene		83-32-9	20	10	U	10	U	10	U	10	U	10	U
Acenaphthylene		208-96-8	NE	10	U	10	U	10	U	10	U	10	U
Acetophenone		98-86-2	NE	10	U	10	U	10	U	10	U	10	U
Anthracene		120-12-7	50	10	U	10	U	10	U	10	U	10	U
Atrazine		1912-24-9	7.5	10	U *	10	U *	10	U *	10	U *	10	U *
Benzaldehyde		100-52-7	NE	10	U *	10	U *	10	U *	10	U *	10	U *
Benzo[a]anthracene		56-55-3	0.002	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Benzo[a]pyrene		50-32-8	ND	1.0	U *	1.0	U *	1.0	U *	1.0	U *	1.0	U *
Benzo[b]fluoranthene		205-99-2	0.002	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Benzo[g,h,i]perylene		191-24-2	NE	10	U	10	U	10	U	10	U	10	U
Benzo[k]fluoranthene		207-08-9	0.002	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Bis(2-chloroethoxy)methane		111-91-1	5	10	U	10	U	10	U	10	U	10	U
Bis(2-chloroethyl)ether		111-44-4	1	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Bis(2-ethylhexyl) phthalate		117-81-7	5	10	U	10	U	10	U	10	U	10	U
Butyl benzyl phthalate		85-68-7	50	10	U	10	U	10	U	10	U	10	U
Caprolactam		105-60-2	NE	10	U	10	U	10	U *	10	U *	10	U *
Carbazole		86-74-8	NE	10	U	10	U	10	U	10	U	10	U
Chrysene		218-01-9	0.002	10	U	10	U	10	U	10	U	10	U
Dibenz(a,h)anthracene		53-70-3	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Dibenzofuran		132-64-9	NE	10	U	10	U	10	U	10	U	10	U
Diethyl phthalate		84-66-2	50	10	U	10	U	10	U	10	U	10	U
Dimethyl phthalate		131-11-3	50	10	U	10	U	10	U	10	U	10	U
Di-n-butyl phthalate		84-74-2	50	10	U	10	U	10	U	10	U	10	U
Di-n-octyl phthalate		117-84-0	50	10	U	10	U	10	U	10	U	10	U
Fluoranthene		206-44-0	50	10	U	10	U	10	U	10	U	10	U
Fluorene		86-73-7	50	10	U	10	U	10	U	10	U	10	U
Hexachlorobenzene		118-74-1	0.04	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Hexachlorobutadiene		87-68-3	0.5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Hexachlorocyclopentadiene		77-47-4	5	10	U	10	U	10	U	10	U	10	U
Hexachloroethane		67-72-1	5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Indeno[1,2,3-cd]pyrene		193-39-5	0.002	2.0	U *	2.0	U	2.0	U	2.0	U	2.0	U
Isophorone		78-59-1	50	10	U	10	U	10	U	10	U	10	U
Naphthalene		91-20-3	10	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Nitrobenzene		98-95-3	0.4	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
N-Nitrosodi-n-propylamine		621-64-7	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
N-Nitrosodiphenylamine		86-30-6	50	10	U	10	U	10	U	10	U	10	U
Pentachlorophenol		87-86-5	1	30	U	30	U	30	U	30	U	30	U
Phenanthrene		85-01-8	50	10	U	10	U	10	U	10	U	10	U
Phenol		108-95-2	1	10	U	10	U	10	U	10	U	10	U
Pyrene		129-00-0	50	10	U	10	U	10	U	10	U	10	U
Total SVOCs		NE	NE	0.0		0.0		0.0		0.0		0.0	
Total Estimated TICs		NE	NE	0.0*T		0.0*T		0.0*T		0.0*T		0.0*T	

Table 2. Pre-ISCO Groundwater Baseline Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-P2		MW-P3		DUP20201209		MW-P4	
			Sample Date	12/15/2020		12/15/2020		12/9/2020		12/9/2020		12/9/2020	
			Parent Sample							MW-P3			
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Semi-Volatile Organic Compounds (SIM method)	ug/L												
1,4-Dioxane		123-91-1	0.35	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Metals, Total	ug/L												
Aluminum		7429-90-5		**12800**		**4180**		**52.6**		**65.5**		**68.3**	
Aluminum, Dissolved				40.0	U	40.0	U	NA		NA		NA	
Antimony		7440-36-0	3	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Antimony, Dissolved			3	2.0	U	2.0	U	NA		NA		NA	
Arsenic		7440-38-2	25	**1.8**	**J**	2.0	U	2.0	U	2.0	U	2.0	U
Arsenic, Dissolved			25	2.0	U	2.0	U	NA		NA		NA	
Barium		7440-39-3	1000	**313**		**172**		**94.9**		**101**		**87.8**	
Barium, Dissolved			1000	**209**		**135**		NA		NA		NA	
Beryllium		7440-41-7		**0.67**	**J**	**0.17**	**J**	0.80	U	0.80	U	0.80	U
Beryllium, Dissolved				0.80	U	0.80	U	NA		NA		NA	
Cadmium		7440-43-9	5	**0.22**	**J**	2.0	U	2.0	U	2.0	U	2.0	U
Cadmium, Dissolved			5	2.0	U	2.0	U	NA		NA		NA	
Calcium		7440-70-2		**163000**		**125000**		**97500**		**103000**		**75900**	
Calcium, Dissolved				**156000**		**126000**		NA		NA		NA	
Chromium		7440-47-3	50	**32.4**		**26.6**		**6.8**		**7.0**		**8.2**	
Chromium, Dissolved			50	**3.9**	**J**	**11.0**		NA		NA		NA	
Cobalt		7440-48-4		**19.0**		**3.8**	**J**	**0.98**	**J**	**0.98**	**J**	**1.7**	**J**
Cobalt, Dissolved				**1.0**	**J**	4.0	U	NA		NA		NA	
Copper		7440-50-8	200	**49.4**		**12.2**		4.0	U	4.0	U	**2.5**	**J**
Copper, Dissolved			200	4.0	U	4.0	U	NA		NA		NA	
Iron		7439-89-6	300	**24400**		**5780**		**129**		**144**		**85.4**	**J**
Iron, Dissolved			300	120	U	120	U	NA		NA		NA	
Lead		7439-92-1	25	**13.4**		**2.8**		1.2	U	1.2	U	1.2	U
Lead, Dissolved			25	**0.88**	**B**	**0.74**	**B**	NA		NA		NA	
Magnesium		7439-95-4		**71400**		**45700**		**33800**		**34900**		**27200**	
Magnesium, Dissolved				**66300**		**45800**		NA		NA		NA	
Manganese		7439-96-5	300	**585**		**194**		**36.8**		**37.3**		**5.2**	**J**
Manganese, Dissolved			300	**120**		**32.7**		NA		NA		NA	
Nickel		7440-02-0	100	**35.9**		**9.9**		**0.96**	**J**	**1.1**	**J**	**0.88**	**J**
Nickel, Dissolved			100	**1.8**	**J**	**0.46**	**J**	NA		NA		NA	
Potassium		7440-09-7		**12500**		**7460**		**3380**		**3550**		**3780**	
Potassium, Dissolved				**10700**		**7070**		NA		NA		NA	
Selenium		7782-49-2	10	**2.3**	**J**	**6.6**		**2.5**		**2.7**		**3.7**	
Selenium, Dissolved			10	**2.6**		**6.8**		NA		NA		NA	
Silver		7440-22-4	50	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Silver, Dissolved			50	2.0	U	2.0	U	NA		NA		NA	
Sodium		7440-23-5	20000	**286000**		**60700**		**119000**		**129000**		**126000**	
Sodium, Dissolved			20000	**346000**		**66000**		NA		NA		NA	
Thallium		7440-28-0		**0.27**	**J**	0.80	U	0.80	U	0.80	U	0.80	U
Thallium, Dissolved				**0.21**	**J**	0.80	U	NA		NA		NA	
Vanadium		7440-62-2		**31.6**		**9.1**		**1.2**	**J**	**1.2**	**J**	**1.2**	**J**
Vanadium, Dissolved				**0.81**	**J**	**1.3**	**J**	NA		NA		NA	
Zinc		7440-66-6		**91.7**		**18.5**		16.0	U	16.0	U	16.0	U
Zinc, Dissolved				16.0	U	16.0	U	NA		NA		NA	

Table 2. Pre-ISCO Groundwater Baseline Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-P2		MW-P3		DUP20201209		MW-P4	
			Sample Date	12/15/2020		12/15/2020		12/9/2020		12/9/2020		12/9/2020	
			Parent Sample							MW-P3			
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Mercury	ug/L												
Mercury		7439-97-6	0.7	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Mercury, Dissolved		7439-97-6	0.7	0.20	U	0.20	U	NA		NA		NA	
Pesticides	ug/L												
4,4'-DDD		72-54-8	0.3	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
4,4'-DDE		72-55-9	0.2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
4,4'-DDT		50-29-3	0.2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Aldrin		309-00-2	ND	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
alpha-BHC		319-84-6	0.01	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
beta-BHC		319-85-7	0.04	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Chlordane (technical)		12789-03-6	0.05	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
delta-BHC		319-86-8	0.04	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Dieldrin		60-57-1	0.004	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endosulfan I		959-98-8	NE	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endosulfan II		33213-65-9	NE	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endosulfan sulfate		1031-07-8	NE	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endrin		72-20-8	ND	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endrin aldehyde		7421-93-4	5	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endrin ketone		53494-70-5	5	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
gamma-BHC (Lindane)		58-89-9	0.05	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Heptachlor		76-44-8	0.04	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Heptachlor epoxide		1024-57-3	0.03	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Methoxychlor		72-43-5	35	0.020	U *	0.020	U *	0.020	U	0.020	U	0.020	U
Toxaphene		8001-35-2	0.06	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
PCBs	ug/L												
Aroclor 1016		12674-11-2	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1221		11104-28-2	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1232		11141-16-5	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1242		53469-21-9	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1248		12672-29-6	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1254		11097-69-1	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1260		11096-82-5	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1268		11100-14-4	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor-1262		37324-23-5	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Polychlorinated biphenyls, Total		1336-36-3	0.09	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U

Table 2. Pre-ISCO Groundwater Baseline Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-P2		MW-P3		DUP20201209		MW-P4	
			Sample Date	12/15/2020		12/15/2020		12/9/2020		12/9/2020		12/9/2020	
			Parent Sample							MW-P3			
Analyte	Units	CAS No.	NYS AWQS										
Perfluoroundecanoic Acids EPA 537	ng/L												
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)		27619-97-2	NE	**3.09**	**J**	4.64	U	4.27	U	**0.67**	**J**	4.94	U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)		39108-34-4	NE	1.81	U	1.86	U	1.71	U	1.67	U	1.98	U
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)		2991-50-6	NE	4.52	U	4.64	U	4.27	U	4.18	U	4.94	U
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)		2355-31-9	NE	4.52	U	4.64	U	4.27	U	4.18	U	4.94	U
Perfluorobutanesulfonic acid (PFBS)		375-73-5	NE	**8.52**		**4.67**		**10.9**		**11.5**		**9.54**	
Perfluorobutanoic acid (PFBA)		375-22-4	NE	**23.9**		**35.7**		**28.4**		**27.6**		**19.3**	
Perfluorodecanesulfonic acid (PFDS)		335-77-3	NE	1.81	U	1.86	U	1.71	U	1.67	U	1.98	U
Perfluorodecanoic acid (PFDA)		335-76-2	NE	1.81	U	1.86	U	1.71	U	1.67	U	1.98	U
Perfluorododecanoic acid (PFDoA)		307-55-1	NE	1.81	U	1.86	U	1.71	U	1.67	U	1.98	U
Perfluoroheptanesulfonic Acid (PFHpS)		375-92-8	NE	**0.94**	**J**	1.86	U	1.71	U	1.67	U	**0.66**	**J**
Perfluoroheptanoic acid (PFHpA)		375-85-9	NE	**51.1**		**14.7**		**18.7**		**18.7**		**13.7**	
Perfluorohexanesulfonic acid (PFHxS)		355-46-4	NE	**18**		**4.47**		**6.18**		**6.12**		**7.39**	
Perfluorohexanoic acid (PFHxA)		307-24-4	NE	**53.9**		**15.1**		**31.4**		**31.3**		**24.6**	
Perfluorononanoic acid (PFNA)		375-95-1	NE	**0.89**	**J**	1.86	U	1.71	U	1.67	U	**1.53**	**J**
Perfluorooctanesulfonamide (FOSA)		754-91-6	NE	1.81	U	1.86	U	1.71	U	1.67	U	1.98	U
Perfluorooctanesulfonic acid (PFOS)		1763-23-1	NE	**9.28**		**2.89**		**3.64**		**3.51**		**15.1**	
Perfluorooctanoic acid (PFOA)		335-67-1	NE	**40.9**		**49.3**		**29.8**		**28.7**		**55.8**	
Perfluoropentanoic acid (PFPeA)		2706-90-3	NE	**75.2**		**19.8**		**41.5**		**41.4**		**24.6**	
Perfluorotetradecanoic acid (PFTeA)		376-06-7	NE	1.81	U	1.86	U	1.71	U	1.67	U	1.98	U
Perfluorotridecanoic acid (PFTriA)		72629-94-8	NE	1.81	U	1.86	U	1.71	U	1.67	U	1.98	U
Perfluoroundecanoic acid (PFUnA)		2058-94-8	NE	1.81	U	1.86	U	1.71	U	1.67	U	1.98	U
Total PFOS + PFOA		N/A	NE	**50.18**		**52.19**		**33.44**		**32.21**		**70.9**	
Total PFAS		N/A	500	**285.72**		**146.63**		**170.52**		**169.5**		**172.22**	

Notes:

ng/L = nanogram per liter
µg/L = micrograms per liter or parts per billion (ppb)

NYS AWQS = New York State Ambient Water Quality Standards and Guidance Values for
TICs = Tentatively Identified Compounds
CAS No. = Chemical Abstracts Service Number
NA = Not Analyzed
NE = Not Established
NYSDEC = New York State Department of Environmental Conservation

Bolding indicates a detected result concentration
Shading and bolding indicates that the detected concentration is above the NYS AWQS it was compared to

Qualifiers:

J = The result is an estimated value.
R = The result is rejected.
U = The result was not detected above the reporting limit.
UJ = The results was not detected at or above the reporting limit shown and the reporting
* = Laboratory Control Sample is outside acceptance limits
B = Compound was found in the blank and sample.

Table 3. Post-ISCO Groundwater Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-P2		MW-P3		DUP20210325		MW-P4	
			Sample Date	3/25/2021		3/29/2021		3/25/2021		3/25/2021		3/29/2021	
			Parent Sample							MW-P3			
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Volatile Organic Compounds	ug/L												
1,1,1-Trichloroethane		71-55-6	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1,2,2-Tetrachloroethane		79-34-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1,2-Trichloroethane		79-00-5	1	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-Dichloroethane		75-34-3	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-Dichloroethene		75-35-4	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2,3-Trichlorobenzene		87-61-6	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2,4-Trichlorobenzene		120-82-1	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dibromo-3-Chloropropane		96-12-8	0.04	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dichlorobenzene		95-50-1	3	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dichloroethane		107-06-2	0.6	1.0	U	1.0	U *	1.0	U	1.0	U	1.0	U *
1,2-Dichloropropane		78-87-5	1	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,3-Dichlorobenzene		541-73-1	3	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,4-Dichlorobenzene		106-46-7	3	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,4-Dioxane		123-91-1	NE	50	U	50	U	50	U	50	U	50	U
2-Butanone (MEK)		78-93-3	50	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
2-Hexanone		591-78-6	50	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
4-Methyl-2-pentanone (MIBK)		108-10-1	NE	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Acetone		67-64-1	50	5.0	U	5.0	U	**35**		**33**		5.0	U
Benzene		71-43-2	1	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Bromoform		75-25-2	50	1.0	U	1.0	U	**5.9**		**5.7**		1.0	U
Bromomethane		74-83-9	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Carbon disulfide		75-15-0	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Carbon tetrachloride		56-23-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chlorobenzene		108-90-7	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chlorobromomethane		74-97-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chlorodibromomethane		124-48-1	50	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chloroethane		75-00-3	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chloroform		67-66-3	7	**2.0**		1.0	U	**1.9**		**1.8**		**0.63**	**J**
Chloromethane		74-87-3	5	1.0	U *	1.0	U *	1.0	U *	1.0	U *	1.0	U *
cis-1,2-Dichloroethene		156-59-2	5	**0.96**	**J**	1.0	U	1.0	U	1.0	U	1.0	U
cis-1,3-Dichloropropene		10061-01-5	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Cyclohexane		110-82-7	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Dichlorobromomethane		75-27-4	50	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Dichlorodifluoromethane		75-71-8	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Ethylbenzene		100-41-4	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Ethylene Dibromide		106-93-4	0.0006	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Isopropylbenzene		98-82-8	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Methyl acetate		79-20-9	NE	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Methyl tert-butyl ether		1634-04-4	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Methylcyclohexane		108-87-2	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Methylene Chloride		75-09-2	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
m-Xylene & p-Xylene		179601-23-1	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
o-Xylene		95-47-6	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Styrene		100-42-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Tetrachloroethene		127-18-4	5	**140**		**31**		**45**		**44**		**25**	
Toluene		108-88-3	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
trans-1,2-Dichloroethene		156-60-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
trans-1,3-Dichloropropene		10061-02-6	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Trichloroethene		79-01-6	5	**1.9**		1.0	U	**0.83**	**J**	**0.68**	**J**	1.0	U
Trichlorofluoromethane		75-69-4	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Vinyl chloride		75-01-4	2	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total VOCs				**144.86**		**31.0**		**88.63**		**85.18**		**25.63**	
Total Estimated TICs				0.0*T		0.0*T		0.0*T		0.0*T		0.0*T	

Table 4. Q2 2021 Groundwater Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-X		MW-P2		MW-P3		MW-P4	
			Sample Date	6/29/2021		6/29/2021		6/29/2021		6/29/2021		6/29/2021	
			Parent Sample			MW-P1							
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Volatile Organic Compounds	ug/L												
1,1,1-Trichloroethane		71-55-6	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1,2,2-Tetrachloroethane		79-34-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	5	1.0	UJ	1.0	UJ	1.0	UJ	1.0	UJ	1.0	UJ
1,1,2-Trichloroethane		79-00-5	1	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-Dichloroethane		75-34-3	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-Dichloroethene		75-35-4	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2,3-Trichlorobenzene		87-61-6	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2,4-Trichlorobenzene		120-82-1	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dibromo-3-Chloropropane		96-12-8	0.04	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dichlorobenzene		95-50-1	3	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dichloroethane		107-06-2	0.6	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-Dichloropropane		78-87-5	1	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,3-Dichlorobenzene		541-73-1	3	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,4-Dichlorobenzene		106-46-7	3	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,4-Dioxane		123-91-1	NE	50	U	50	U	50	U	50	U	50	U
2-Butanone (MEK)		78-93-3	50	5.0	U	5.0	U	5.0	U	**2.2**	**J**	5.0	U
2-Hexanone		591-78-6	50	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
4-Methyl-2-pentanone (MIBK)		108-10-1	NE	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Acetone		67-64-1	50	5.0	U	5.0	U	5.0	U	**35**		5.0	U
Benzene		71-43-2	1	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Bromoform		75-25-2	50	1.0	U	1.0	U	1.0	U	**8.3**		1.0	U
Bromomethane		74-83-9	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Carbon disulfide		75-15-0	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Carbon tetrachloride		56-23-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chlorobenzene		108-90-7	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chlorobromomethane		74-97-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chlorodibromomethane		124-48-1	50	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chloroethane		75-00-3	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Chloroform		67-66-3	7	**1.4**		**1.5**		1.0	U	**1.4**		**2.2**	
Chloromethane		74-87-3	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
cis-1,2-Dichloroethene		156-59-2	5	**0.55**	**J**	**0.60**	**J**	1.0	U	1.0	U	1.0	U
cis-1,3-Dichloropropene		10061-01-5	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Cyclohexane		110-82-7	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Dichlorobromomethane		75-27-4	50	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Dichlorodifluoromethane		75-71-8	5	1.0	UJ	1.0	UJ	1.0	UJ	1.0	U	1.0	UJ
Ethylbenzene		100-41-4	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Ethylene Dibromide		106-93-4	0.0006	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Isopropylbenzene		98-82-8	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Methyl acetate		79-20-9	NE	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Methyl tert-butyl ether		1634-04-4	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Methylcyclohexane		108-87-2	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Methylene Chloride		75-09-2	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
m-Xylene & p-Xylene		179601-23-1	NE	1.0	U	1.0	U	1.0	U	1.0	UJ	1.0	U
o-Xylene		95-47-6	5	1.0	U	1.0	U	1.0	U	1.0	UJ	1.0	U
Styrene		100-42-5	5	1.0	U	1.0	U	1.0	U	1.0	R	1.0	U
Tetrachloroethene		127-18-4	5	**66**		**72**		**26**		**27**		**11**	
Toluene		108-88-3	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
trans-1,2-Dichloroethene		156-60-5	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
trans-1,3-Dichloropropene		10061-02-6	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Trichloroethene		79-01-6	5	**1.1**		**0.93**	**J**	1.0	U	**0.80**	**J**	1.0	U
Trichlorofluoromethane		75-69-4	5	1.0	UJ	1.0	UJ	1.0	UJ	1.0	UJ	1.0	UJ
Vinyl chloride		75-01-4	2	1.0	U	1.0	U	1.0	U	1.0	UJ	1.0	U
Total VOCs				**69.1**		**75.0**		**26**		**74.7**		**13.2**	
Total Estimated TICs				0		0		0		0		0	

Table 4. Q2 2021 Groundwater Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-X		MW-P2		MW-P3		MW-P4	
			Sample Date	6/29/2021		6/29/2021		6/29/2021		6/29/2021		6/29/2021	
			Parent Sample			MW-P1							
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Semi-Volatile Organic Compounds	ug/L												
1,1'-Biphenyl		92-52-4	5	10	U	10	U	13	U	10	U	10	U
1,2,4,5-Tetrachlorobenzene		95-94-3	5	10	U	10	U	13	U	10	U	10	U
2,2'-oxybis[1-chloropropane]		108-60-1	5	10	U	10	U	13	U	10	U	10	U
2,3,4,6-Tetrachlorophenol		58-90-2	NE	10	UJ	10	UJ	13	UJ	10	UJ	10	UJ
2,4,5-Trichlorophenol		95-95-4	NE	10	U	10	U	13	U	10	U	10	U
2,4,6-Trichlorophenol		88-06-2	NE	10	U	10	U	13	U	10	U	10	U
2,4-Dichlorophenol		120-83-2	5	10	U	10	U	13	U	10	U	10	U
2,4-Dimethylphenol		105-67-9	50	10	U	10	U	13	U	10	UJ	10	U
2,4-Dinitrophenol		51-28-5	10	20	UJ	20	UJ	25	UJ	20	UJ	20	UJ
2,4-Dinitrotoluene		121-14-2	5	2.0	U	2.0	U	2.5	U	2.0	UJ	2.0	U
2,6-Dinitrotoluene		606-20-2	5	2.0	U	2.0	U	2.5	U	2.0	UJ	2.0	U
2-Chloronaphthalene		91-58-7	10	10	U	10	U	13	U	10	U	10	U
2-Chlorophenol		95-57-8	NE	10	U	10	U	13	U	10	UJ	10	U
2-Methylnaphthalene		91-57-6	NE	10	U	10	U	13	U	10	U	10	U
2-Methylphenol		95-48-7	NE	10	U	10	U	13	U	10	UJ	10	U
2-Nitroaniline		88-74-4	5	10	UJ	10	UJ	13	UJ	10	UJ	10	UJ
2-Nitrophenol		88-75-5	NE	10	U	10	U	13	U	10	U	10	U
3,3'-Dichlorobenzidine		91-94-1	5	10	U	10	U	13	U	10	UJ	10	U
3-Nitroaniline		99-09-2	5	10	U	10	U	13	U	10	UJ	10	U
4,6-Dinitro-2-methylphenol		534-52-1	NE	20	UJ	20	UJ	25	UJ	20	UJ	20	UJ
4-Bromophenyl phenyl ether		101-55-3	NE	10	U	10	U	13	U	10	U	10	U
4-Chloro-3-methylphenol		59-50-7	NE	10	U	10	U	13	U	10	UJ	10	U
4-Chloroaniline		106-47-8	5	10	U	10	U	13	U	10	UJ	10	U
4-Chlorophenyl phenyl ether		7005-72-3	NE	10	U	10	U	13	U	10	UJ	10	U
4-Methylphenol		106-44-5	NE	10	U	10	U	13	U	10	UJ	10	U
4-Nitroaniline		100-01-6	5	10	U	10	U	13	U	10	UJ	10	U
4-Nitrophenol		100-02-7	NE	20	U	20	U	25	U	20	U	20	U
Acenaphthene		83-32-9	20	10	U	10	U	13	U	10	U	10	U
Acenaphthylene		208-96-8	NE	10	U	10	U	13	U	10	UJ	10	U
Acetophenone		98-86-2	NE	10	U	10	U	13	U	10	UJ	10	U
Anthracene		120-12-7	50	10	U	10	U	13	U	10	UJ	10	U
Atrazine		1912-24-9	7.5	2.0	U	2.0	U	2.5	U	2.0	U	2.0	U
Benzaldehyde		100-52-7	NE	10	UJ	10	UJ	13	UJ	10	UJ	10	UJ
Benzo[a]anthracene		56-55-3	0.002	1.0	U	1.0	U	1.3	U	1.0	U	1.0	U
Benzo[a]pyrene		50-32-8	ND	1.0	U	1.0	U	1.3	U	1.0	U	1.0	U
Benzo[b]fluoranthene		205-99-2	0.002	2.0	U	2.0	U	2.5	U	2.0	U	2.0	U
Benzo[g,h,i]perylene		191-24-2	NE	10	UJ	10	UJ	13	UJ	10	UJ	10	UJ
Benzo[k]fluoranthene		207-08-9	0.002	1.0	U	1.0	U	1.3	U	1.0	U	1.0	U
Bis(2-chloroethoxy)methane		111-91-1	5	10	U	10	U	13	U	10	UJ	10	U
Bis(2-chloroethyl)ether		111-44-4	1	1.0	UJ	1.0	UJ	1.3	UJ	1.0	UJ	1.0	UJ
Bis(2-ethylhexyl) phthalate		117-81-7	5	2.0	U	2.0	U	2.5	U	2.0	U	2.0	U
Butyl benzyl phthalate		85-68-7	50	10	U	10	U	13	U	10	U	10	U
Caprolactam		105-60-2	NE	10	U	10	U	**43**		10	U	10	U
Carbazole		86-74-8	NE	10	U	10	U	13	U	10	UJ	10	U
Chrysene		218-01-9	0.002	2.0	U	2.0	U	2.5	U	2.0	U	2.0	U
Dibenz(a,h)anthracene		53-70-3	NE	1.0	UJ	1.0	UJ	1.3	UJ	1.0	UJ	1.0	UJ
Dibenzofuran		132-64-9	NE	10	U	10	U	13	U	10	UJ	10	U
Diethyl phthalate		84-66-2	50	10	U	10	U	13	U	10	UJ	10	U
Dimethyl phthalate		131-11-3	50	10	U	10	U	13	U	10	UJ	10	U
Di-n-butyl phthalate		84-74-2	50	10	U	10	UJ	13	U	10	UJ	10	U
Di-n-octyl phthalate		117-84-0	50	10	UJ	10	UJ	13	UJ	10	UJ	10	UJ
Fluoranthene		206-44-0	50	10	U	10	U	13	U	10	UJ	10	U
Fluorene		86-73-7	50	10	U	10	U	13	U	10	UJ	10	U
Hexachlorobenzene		118-74-1	0.04	1.0	U *	1.0	U *	1.3	U *	1.0	U *	1.0	U *
Hexachlorobutadiene		87-68-3	0.5	1.0	UJ	1.0	UJ	1.3	UJ	1.0	UJ	1.0	UJ
Hexachlorocyclopentadiene		77-47-4	5	10	UJ	10	UJ	13	UJ	10	UJ	10	UJ
Hexachloroethane		67-72-1	5	2.0	U	2.0	U	2.5	U	2.0	U	2.0	U
Indeno[1,2,3-cd]pyrene		193-39-5	0.002	2.0	UJ	2.0	UJ	2.5	UJ	2.0	UJ	2.0	UJ
Isophorone		78-59-1	50	10	U	10	U	13	U	10	UJ	10	U
Naphthalene		91-20-3	10	2.0	U	2.0	U	2.5	U	2.0	UJ	2.0	U
Nitrobenzene		98-95-3	0.4	1.0	U	1.0	U	1.3	U	1.0	UJ	1.0	U
N-Nitrosodi-n-propylamine		621-64-7	NE	1.0	U	1.0	U	1.3	U	1.0	U	1.0	U
N-Nitrosodiphenylamine		86-30-6	50	10	U	10	U	13	U	10	UJ	10	U
Pentachlorophenol		87-86-5	1	20	UJ	20	UJ	25	UJ	20	UJ	20	UJ
Phenanthrene		85-01-8	50	10	U	10	U	13	U	10	U	10	U
Phenol		108-95-2	1	10	U	10	U	13	U	10	UJ	10	U
Pyrene		129-00-0	50	10	U	10	U	13	U	10	U	10	U
Total SVOCs		NE	NE	0		0		**43**		0		0	
Total Estimated TICs		NE	NE	0		0		0		0		0	

Table 4. Q2 2021 Groundwater Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-X		MW-P2		MW-P3		MW-P4	
			Sample Date	6/29/2021		6/29/2021		6/29/2021		6/29/2021		6/29/2021	
			Parent Sample			MW-P1							
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Metals, Total	ug/L												
Aluminum		7429-90-5		**69100**		**78400**		**49200**		**597**		**26100**	
Aluminum, Dissolved				40.0	U	40.0	U	**43.6**		40.0	U	40.0	U
Antimony		7440-36-0	3	2.0	U	2.0	U	**0.95**	**J**	2.0	U	2.0	U
Antimony, Dissolved			3	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Arsenic		7440-38-2	25	**9.5**		**10.9**		**9.7**		2.0	U	**5.4**	
Arsenic, Dissolved			25	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Barium		7440-39-3	1000	**774**		**837**		**554**		**23.7**		**303**	
Barium, Dissolved			1000	**123**		**119**		**69.4**		**43.7**		**60.1**	**B**
Beryllium		7440-41-7		**2.9**		**3.4**		**2.0**		0.80	U	**1.1**	
Beryllium, Dissolved				0.80	U	0.80	U	0.80	U	0.80	U	0.80	U
Cadmium		7440-43-9	5	**1.0**	**J**	**0.98**	**J**	**0.45**	**J**	2.0	U	**0.39**	**J**
Cadmium, Dissolved			5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Calcium		7440-70-2		**254000**		**321000**		**312000**		**24200**		**131000**	
Calcium, Dissolved				**100000**		**100000**		**179000**		**170000**		**56700**	
Chromium		7440-47-3	50	**198**		**217**		**286**		4.0	U	**119**	
Chromium, Dissolved			50	4.0	U	4.0	U	**6.5**		**54.5**		**14.7**	
Cobalt		7440-48-4		**85.4**		**92.4**		**54.5**		**0.91**	**J**	**35.3**	
Cobalt, Dissolved				4.0	U	4.0	U	4.0	U	**1.1**	**J**	4.0	U
Copper		7440-50-8	200	**226**		**247**		**171**		**4.3**		**86.9**	
Copper, Dissolved			200	4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
Iron		7439-89-6	300	**129000**		**144000**		**87400**		**861**		**50900**	
Iron, Dissolved			300	120	U	120	U	120	U	120	U	120	U
Lead		7439-92-1	25	**60.5**		**66.2**		**56.0**		**3.3**		**49.4**	
Lead, Dissolved			25	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U
Magnesium		7439-95-4		**120000**		**149000**		**80400**		**6280**		**68800**	
Magnesium, Dissolved				**18200**		**18500**		**111**	**J**	**60500**		**22200**	
Manganese		7439-96-5	300	**2490**		**2850**		**2640**		**163**		**1260**	
Manganese, Dissolved			300	**43.6**		**44.9**		8.0	U	8.0	U	**19.2**	
Nickel		7440-02-0	100	**188**		**206**		**176**		**2.1**	**J**	**94.7**	
Nickel, Dissolved			100	**2.8**	**J**	**3.2**	**J**	4.0	U	**1.5**	**J**	**1.4**	**J**
Potassium		7440-09-7		**25900**		**28000**		**18800**		**1960**		**8810**	
Potassium, Dissolved				**6960**		**6870**		**8960**		**4620**		2490	
Selenium		7782-49-2	10	**3.0**		**2.9**		**4.2**		2.5	U	**1.9**	**J**
Selenium, Dissolved			10	**2.0**	**J**	**1.7**	**J**	**4.7**		**4.5**		**2.0**	**J**
Silver		7440-22-4	50	**0.29**	**J**	**0.31**	**J**	**0.73**	**J**	2.0	U	**0.29**	**J**
Silver, Dissolved			50	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Sodium		7440-23-5	20000	**178000**		**174000**		**36300**		**15400**		**92300**	
Sodium, Dissolved			20000	**196000**		**198000**		**39100**		**416000**		**103000**	**B**
Thallium		7440-28-0		**1.5**		**1.7**		**1.0**		0.80	U	**0.52**	**J**
Thallium, Dissolved				0.80	U	0.80	U	0.80	U	0.80	U	0.80	U
Vanadium		7440-62-2		**175**		**194**		**119**		4.0	U	**79.0**	
Vanadium, Dissolved				4.0	U	4.0	U	**3.0**	**J**	**1.1**	**J**	**0.81**	**J**
Zinc		7440-66-6		**471**		**520**		**328**		**8.9**	**J**	**192**	
Zinc, Dissolved				16.0	U	16.0	U	**14.1**	**J**	16.0	U	**13.1**	**J**
Mercury	ug/L												
Mercury		7439-97-6	0.7	0.20	U	0.20	U	0.20	U	**0.82**		0.20	U
Mercury, Dissolved		7439-97-6	0.7	0.20	U	0.20	U	0.20	U	**0.54**		0.20	U

Table 4. Q2 2021 Groundwater Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-X		MW-P2		MW-P3		MW-P4	
			Sample Date	6/29/2021		6/29/2021		6/29/2021		6/29/2021		6/29/2021	
			Parent Sample			MW-P1							
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Pesticides	ug/L												
4,4'-DDD		72-54-8	0.3	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
4,4'-DDE		72-55-9	0.2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
4,4'-DDT		50-29-3	0.2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Aldrin		309-00-2	ND	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
alpha-BHC		319-84-6	0.01	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
beta-BHC		319-85-7	0.04	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Chlordane (technical)		12789-03-6	0.05	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
delta-BHC		319-86-8	0.04	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Dieldrin		60-57-1	0.004	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endosulfan I		959-98-8	NE	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endosulfan II		33213-65-9	NE	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endosulfan sulfate		1031-07-8	NE	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endrin		72-20-8	ND	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endrin aldehyde		7421-93-4	5	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endrin ketone		53494-70-5	5	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
gamma-BHC (Lindane)		58-89-9	0.05	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Heptachlor		76-44-8	0.04	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Heptachlor epoxide		1024-57-3	0.03	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Methoxychlor		72-43-5	35	0.020	UJ	0.020	UJ	0.020	UJ	0.020	UJ	0.020	UJ
Toxaphene		8001-35-2	0.06	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
PCBs	ug/L												
Aroclor 1016		12674-11-2	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1221		11104-28-2	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1232		11141-16-5	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1242		53469-21-9	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1248		12672-29-6	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1254		11097-69-1	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1260		11096-82-5	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1268		11100-14-4	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor-1262		37324-23-5	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Polychlorinated biphenyls, Total		1336-36-3	0.09	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U

Notes:

µg/L = micrograms per liter or parts per billion (ppb)

NYS AWQS = New York State Ambient Water Quality Standards and Guidance Values for
TICs = Tentatively Identified Compounds
CAS No. = Chemical Abstracts Service Number
NA = Not Analyzed
NE = Not Established
NYSDEC = New York State Department of Environmental Conservation

Bolding indicates a detected result concentration
Shading and bolding indicates that the detected concentration is above the NYS AWQS it was compared to

Qualifiers:

J = The result is an estimated value.
R = The result is rejected.
U = The result was not detected above the reporting limit.
UJ = The results was not detected at or above the reporting limit shown and the reporting limit
* = Laboratory Control Sample is outside acceptance limits
B = Compound was found in the blank and sample.

Table 3. Post-ISCO Groundwater Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-P2		MW-P3		DUP20210325		MW-P4	
			Sample Date	3/25/2021		3/29/2021		3/25/2021		3/25/2021		3/29/2021	
			Parent Sample							MW-P3			
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Semi-Volatile Organic Compounds	ug/L												
1,1'-Biphenyl		92-52-4	5	10	U	10	U	10	U	10	U	10	U
1,2,4,5-Tetrachlorobenzene		95-94-3	5	10	U	10	U	10	U	10	U	10	U
2,2'-oxybis[1-chloropropane]		108-60-1	5	10	U	10	U	10	U	10	U	10	U
2,3,4,6-Tetrachlorophenol		58-90-2	NE	10	U	10	U	10	U	10	U	10	U
2,4,5-Trichlorophenol		95-95-4	NE	10	U	10	U	10	U	10	U	10	U
2,4,6-Trichlorophenol		88-06-2	NE	10	U	10	U	10	U	10	U	10	U
2,4-Dichlorophenol		120-83-2	5	10	U	10	U	10	U	10	U	10	U
2,4-Dimethylphenol		105-67-9	50	10	U	10	U	10	U	10	U	10	U
2,4-Dinitrophenol		51-28-5	10	30	U	30	U	30	U	30	U	30	U
2,4-Dinitrotoluene		121-14-2	5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
2,6-Dinitrotoluene		606-20-2	5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
2-Chloronaphthalene		91-58-7	10	10	U	10	U	10	U	10	U	10	U
2-Chlorophenol		95-57-8	NE	10	U	10	U	10	U	10	U	10	U
2-Methylnaphthalene		91-57-6	NE	10	U	10	U	10	U	10	U	10	U
2-Methylphenol		95-48-7	NE	10	U	10	U	10	U	10	U	10	U
2-Nitroaniline		88-74-4	5	20	U	20	U	20	U	20	U	20	U
2-Nitrophenol		88-75-5	NE	10	U	10	U	10	U	10	U	10	U
3,3'-Dichlorobenzidine		91-94-1	5	20	U	20	U	20	U	20	U	20	U
3-Nitroaniline		99-09-2	5	20	U	20	U	20	U	20	U	20	U
4,6-Dinitro-2-methylphenol		534-52-1	NE	30	U	30	U	30	U	30	U	30	U
4-Bromophenyl phenyl ether		101-55-3	NE	10	U	10	U	10	U	10	U	10	U
4-Chloro-3-methylphenol		59-50-7	NE	10	U	10	U	10	U	10	U	10	U
4-Chloroaniline		106-47-8	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
4-Chlorophenyl phenyl ether		7005-72-3	NE	10	U	10	U	10	U	10	U	10	U
4-Methylphenol		106-44-5	NE	10	U	10	U	10	U	10	U	10	U
4-Nitroaniline		100-01-6	5	20	U	20	U	20	U	20	U	20	U
4-Nitrophenol		100-02-7	NE	30	U	30	U	30	U	30	U	30	U
Acenaphthene		83-32-9	20	10	U	10	U	10	U	10	U	10	U
Acenaphthylene		208-96-8	NE	10	U	10	U	10	U	10	U	10	U
Acetophenone		98-86-2	NE	10	U	10	U	10	U	10	U	10	U
Anthracene		120-12-7	50	10	U	10	U	10	U	10	U	10	U
Atrazine		1912-24-9	7.5	10	U	10	U	10	U	10	U	10	U
Benzaldehyde		100-52-7	NE	10	U *	10	U	10	U *	10	U *	10	U
Benzo[a]anthracene		56-55-3	0.002	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Benzo[a]pyrene		50-32-8	ND	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Benzo[b]fluoranthene		205-99-2	0.002	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Benzo[g,h,i]perylene		191-24-2	NE	10	U	10	U	10	U	10	U	10	U
Benzo[k]fluoranthene		207-08-9	0.002	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Bis(2-chloroethoxy)methane		111-91-1	5	10	U	10	U	10	U	10	U	10	U
Bis(2-chloroethyl)ether		111-44-4	1	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Bis(2-ethylhexyl) phthalate		117-81-7	5	10	U	10	U	10	U	10	U	10	U
Butyl benzyl phthalate		85-68-7	50	10	U	10	U	10	U	10	U	10	U
Caprolactam		105-60-2	NE	10	U *	10	U	10	U *	10	U *	10	U
Carbazole		86-74-8	NE	10	U	10	U	10	U	10	U	10	U
Chrysene		218-01-9	0.002	10	U	10	U	10	U	10	U	10	U
Dibenz(a,h)anthracene		53-70-3	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Dibenzofuran		132-64-9	NE	10	U	10	U	10	U	10	U	10	U
Diethyl phthalate		84-66-2	50	10	U	10	U	10	U	10	U	10	U
Dimethyl phthalate		131-11-3	50	10	U	10	U	10	U	10	U	10	U
Di-n-butyl phthalate		84-74-2	50	10	U	10	U	10	U	10	U	10	U
Di-n-octyl phthalate		117-84-0	50	10	U	10	U	10	U	10	U	10	U
Fluoranthene		206-44-0	50	10	U	10	U	10	U	10	U	10	U
Fluorene		86-73-7	50	10	U	10	U	10	U	10	U	10	U
Hexachlorobenzene		118-74-1	0.04	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Hexachlorobutadiene		87-68-3	0.5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Hexachlorocyclopentadiene		77-47-4	5	10	U	10	U	10	U	10	U	10	U
Hexachloroethane		67-72-1	5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Indeno[1,2,3-cd]pyrene		193-39-5	0.002	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Isophorone		78-59-1	50	10	U	10	U	10	U	10	U	10	U
Naphthalene		91-20-3	10	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Nitrobenzene		98-95-3	0.4	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
N-Nitrosodi-n-propylamine		621-64-7	NE	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
N-Nitrosodiphenylamine		86-30-6	50	10	U	10	U	10	U	10	U	10	U
Pentachlorophenol		87-86-5	1	30	U	30	U	30	U	30	U	30	U
Phenanthrene		85-01-8	50	10	U	10	U	10	U	10	U	10	U
Phenol		108-95-2	1	10	U	10	U	10	U	10	U	10	U
Pyrene		129-00-0	50	10	U	10	U	10	U	10	U	10	U
Total SVOCs		NE	NE	0.0		0.0		0.0		0.0		0.0	
Total Estimated TICs		NE	NE	**43.0**		0.0*T		**11.0**		**11.0**		10.0	

Table 3. Post-ISCO Groundwater Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-P2		MW-P3		DUP20210325		MW-P4	
			Sample Date	3/25/2021		3/29/2021		3/25/2021		3/25/2021		3/29/2021	
			Parent Sample							MW-P3			
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Metals, Total	ug/L												
Aluminum		7429-90-5		**872**		**1690**		**124**		**215**		**170**	
Aluminum, Dissolved				NA		40.0	U	NA		NA		NA	
Antimony		7440-36-0	3	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Antimony, Dissolved			3	NA		2.0	U	NA		NA		NA	
Arsenic		7440-38-2	25	2.0	U	**0.91**	**J**	2.0	U	2.0	U	2.0	U
Arsenic, Dissolved			25	NA		2.0	U	NA		NA		NA	
Barium		7440-39-3	1000	**172**		**199**		**138**		**146**		**99.4**	
Barium, Dissolved			1000	NA		**132**		NA		NA		NA	
Beryllium		7440-41-7		0.80	U	**0.15**	**J**	0.80	U	0.80	U	0.80	U
Beryllium, Dissolved				NA		0.80	U	NA		NA		NA	
Cadmium		7440-43-9	5	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Cadmium, Dissolved			5	NA		2.0	U	NA		NA		NA	
Calcium		7440-70-2		**114000**		**182000**		**177000**		**180000**		**72600**	
Calcium, Dissolved				NA		**153000**		NA		NA		NA	
Chromium		7440-47-3	50	**6.7**		**21.1**		**65.2**		**70.3**		**98.9**	
Chromium, Dissolved			50	NA		**11.7**		NA		NA		NA	
Cobalt		7440-48-4		**1.4**	**J**	**7.8**		**2.6**		**2.8**	**J**	**0.96**	**J**
Cobalt, Dissolved				NA		4.0	U	NA		NA		NA	
Copper		7440-50-8	200	**4.2**		**16.2**		4.0	U	4.0	U	**3.4**	**J**
Copper, Dissolved			200	NA		4.0	U	NA		NA		NA	
Iron		7439-89-6	300	**1670**		**3250**		**383**		**529**		**344**	
Iron, Dissolved			300	NA		120	U	NA		NA		NA	
Lead		7439-92-1	25	**1.1**	**J**	**4.1**		1.2	U	1.2	U	**2.7**	
Lead, Dissolved			25	NA		1.2	U	NA		NA		NA	
Magnesium		7439-95-4		**40700**		**59700**		**68200**		**69800**		**25300**	
Magnesium, Dissolved				NA		**51300**		NA		NA		NA	
Manganese		7439-96-5	300	**37.2**		**545**		**12.7**		**23.4**		**20.2**	
Manganese, Dissolved			300	NA		**2.3**	**J**	NA		NA		NA	
Nickel		7440-02-0	100	**3.5**	**J**	**8.6**		4.0	U	**1.6**	**J**	**0.91**	**J**
Nickel, Dissolved			100	NA		4.0	U	NA		NA		NA	
Potassium		7440-09-7		**8080**		**5900**		**5640**		**5400**		**6830**	
Potassium, Dissolved				NA		**5560**		NA		NA		NA	
Selenium		7782-49-2	10	**2.3**	**J**	**7.2**		**4.1**		**4.1**		**2.1**	**J**
Selenium, Dissolved			10	NA		**7.3**		NA		NA		NA	
Silver		7440-22-4	50	2.0	U	2.0	U	**0.76**	**J**	**0.79**	**J**	2.0	U
Silver, Dissolved			50	NA		2.0	U	NA		NA		NA	
Sodium		7440-23-5	20000	**286000**		**39900**		**662000**		**666000**		**137000**	
Sodium, Dissolved			20000	NA		**47400**		NA		NA		NA	
Thallium		7440-28-0		0.80	U	0.80	U	0.80	U	0.80	U	0.80	U
Thallium, Dissolved				NA		0.80	U	NA		NA		NA	
Vanadium		7440-62-2		**2.6**	**J**	**5.2**		**2.3**		**2.5**	**J**	**1.1**	**J**
Vanadium, Dissolved				NA		**1.7**	**J**	NA		NA		NA	
Zinc		7440-66-6		**8.5**	**J**	**17.6**		16.0	U	16.0	U	16.0	U
Zinc, Dissolved				NA		16.0	U	NA		NA		NA	
Mercury	ug/L												
Mercury		7439-97-6	0.7	0.20	U	0.20	U	**1.6**		**1.8**		0.20	U
Mercury, Dissolved		7439-97-6	0.7	NA		0.20	U	NA		NA		NA	

Table 3. Post-ISCO Groundwater Sample Analytical Results
Site Management Plan
37-24 37-28 30th Street Redevelopment Site
NYSDEC BCP Site No. C241214

			Sample Name	MW-P1		MW-P2		MW-P3		DUP20210325		MW-P4	
			Sample Date	3/25/2021		3/29/2021		3/25/2021		3/25/2021		3/29/2021	
			Parent Sample							MW-P3			
Analyte	**Units**	**CAS No.**	**NYS AWQS**										
Pesticides	ug/L												
4,4'-DDD		72-54-8	0.3	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
4,4'-DDE		72-55-9	0.2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
4,4'-DDT		50-29-3	0.2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Aldrin		309-00-2	ND	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
alpha-BHC		319-84-6	0.01	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
beta-BHC		319-85-7	0.04	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Chlordane (technical)		12789-03-6	0.05	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
delta-BHC		319-86-8	0.04	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Dieldrin		60-57-1	0.004	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endosulfan I		959-98-8	NE	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endosulfan II		33213-65-9	NE	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endosulfan sulfate		1031-07-8	NE	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endrin		72-20-8	ND	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endrin aldehyde		7421-93-4	5	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Endrin ketone		53494-70-5	5	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
gamma-BHC (Lindane)		58-89-9	0.05	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Heptachlor		76-44-8	0.04	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Heptachlor epoxide		1024-57-3	0.03	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Methoxychlor		72-43-5	35	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Toxaphene		8001-35-2	0.06	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
PCBs	ug/L												
Aroclor 1016		12674-11-2	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1221		11104-28-2	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1232		11141-16-5	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1242		53469-21-9	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1248		12672-29-6	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1254		11097-69-1	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1260		11096-82-5	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor 1268		11100-14-4	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Aroclor-1262		37324-23-5	NE	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U
Polychlorinated biphenyls, Total		1336-36-3	0.09	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U

Notes:

ng/L = nanogram per liter
µg/L = micrograms per liter or parts per billion (ppb)

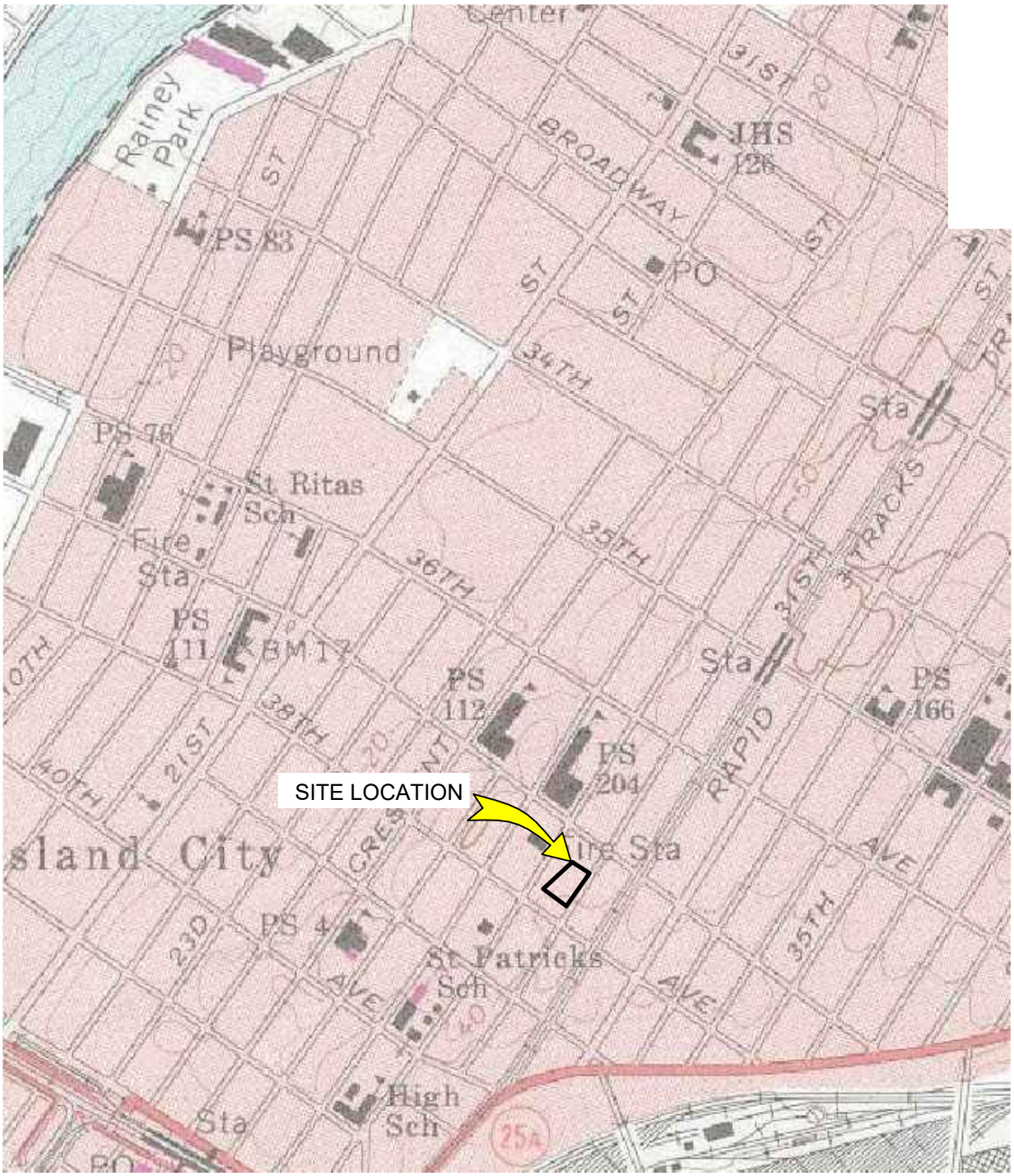
NYS AWQS = New York State Ambient Water Quality Standards and Guidance Values for
TICs = Tentatively Identified Compounds
CAS No. = Chemical Abstracts Service Number
NA = Not Analyzed
NE = Not Established
NYSDEC = New York State Department of Environmental Conservation

Bolding indicates a detected result concentration
Shading and bolding indicates that the detected concentration is above the NYS AWQS it was compared to

Qualifiers:

J = The result is an estimated value.
R = The result is rejected.
U = The result was not detected above the reporting limit.
UJ = The results was not detected at or above the reporting limit shown and the reporting limit
* = Laboratory Control Sample is outside acceptance limits
B = Compound was found in the blank and sample.

FIGURES



0 800 1600

SCALE: 1" = 800'

SOURCE:

1. USGS CENTRAL PARK QUADRANGLE MAP.

Site Management Plan 37-24 & 37-28 30th Street Redevelopment Site Long Island City, New York	GEI Consultants	SITE LOCATION MAP
31ST AVENUE ASSOCIATES LLC & 37-26 30TH AVENUE LLC NEW HYDE PARK, NEW YORK	Project 1800522	December 2021 Fig. 1

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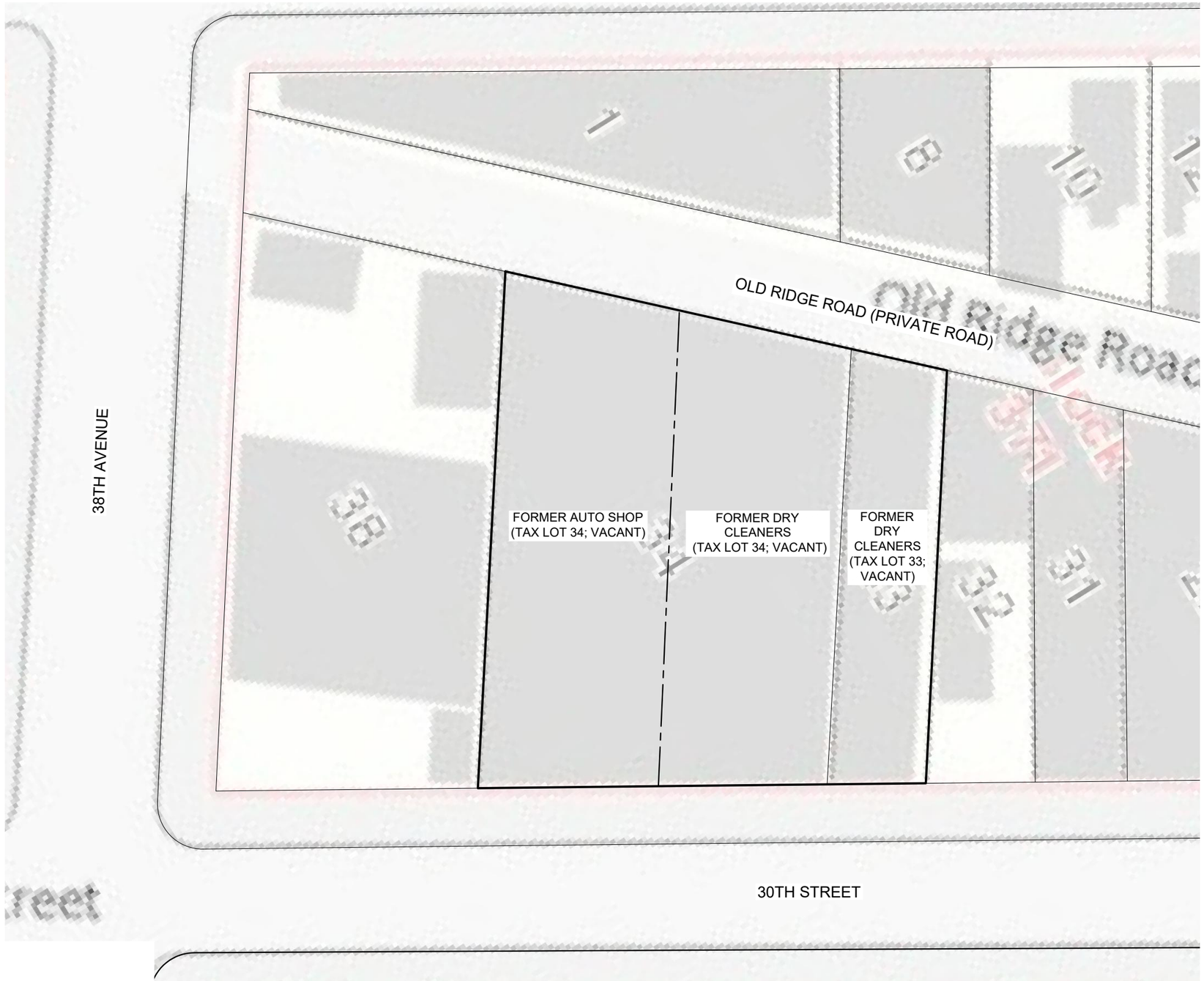

LEGEND:

BROWNFIELD CLEAN UP PROGRAM SITE BOUNDARY

TAX LOT LINE

TAX LOT DIVISION LINE (2 PROPERTIES)

SOURCE:

1. PLAN BASED ON MAP BY NYS OASIS.

0 30 60

SCALE: 1" = 30'

Site Management Plan
37-24 & 37-28 30th Street Redevelopment Site
Long Island City, New York

31ST AVENUE ASSOCIATES LLC &
37-26 30TH AVENUE LLC
NEW HYDE PARK, NEW YORK

GEI Consultants

SITE MAP

Project 1800522 | December 2021 | Fig. 2

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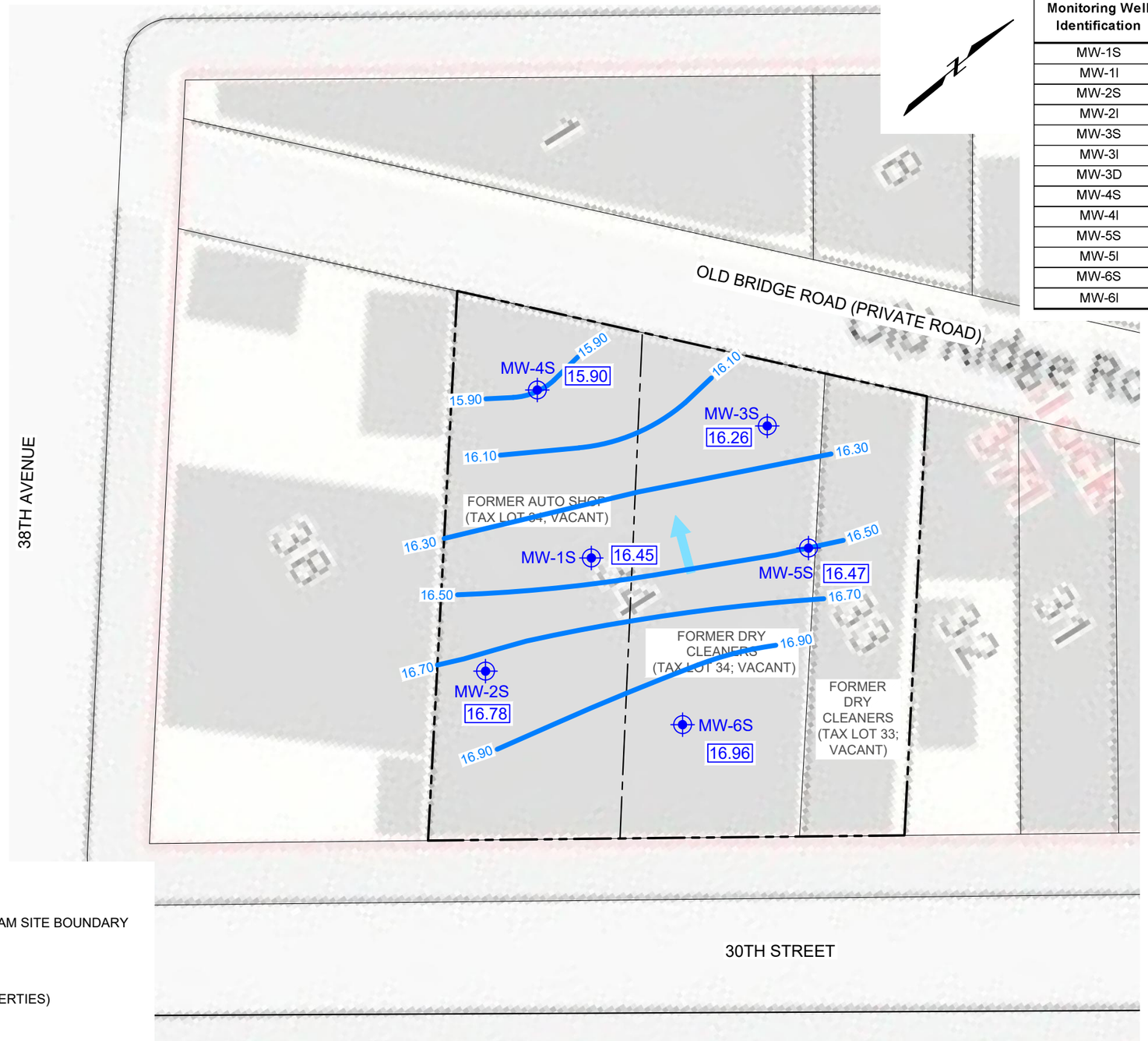
Monitoring Well Identification	Well Elevation (ft amsl)	Depth to Water (ft. bgs)	Groundwater Elevation (ft amsl)
MW-1S	43.83	27.38	16.45
MW-1I	44.21	27.55	16.66
MW-2S	43.32	26.54	16.78
MW-2I	43.86	27.21	16.65
MW-3S	44.04	27.78	16.26
MW-3I	44.53	28.00	16.53
MW-3D	43.27	26.96	16.31
MW-4S	44.21	28.31	15.9
MW-4I	45.49	29.2	16.29
MW-5S	43.84	27.37	16.47
MW-5I	43.94	27.72	16.22
MW-6S	42.94	25.98	16.96
MW-6I	43.4	26.43	16.97



NOTES:
1. AMSL = ABOVE MEAN SEA LEVEL.
2. FT. BGS = FEET BELOW GROUND SURFACE.
3. ONLY SHALLOW MONITORING WELL SURVEYED ELEVATIONS WERE UTILIZED IN DEVELOPMENT OF GROUNDWATER CONTOURS.

LEGEND:

- BROWNFIELD CLEANUP PROGRAM SITE BOUNDARY
- TAX LOT LINE
- TAX LOT DIVISION LINE (2 PROPERTIES)
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (ESTIMATED)
- 15.9 GROUNDWATER ELEVATION (FEET)
- GROUNDWATER FLOW DIRECTION

SOURCE:
1. PLAN BASED ON MAP BY NYS OASIS.

0 30 60
SCALE: 1" = 30'

Site Management Plan
37-24 & 37-28 30th Street Redevelopment Site
Long Island City, New York

31st Avenue Associates LLC & 37-26 30th Avenue LLC
New Hyde Park, New York

GEI Consultants

GROUNDWATER CONTOUR MAP (2019)

Project 1800522 | December 2021 | Fig. 3

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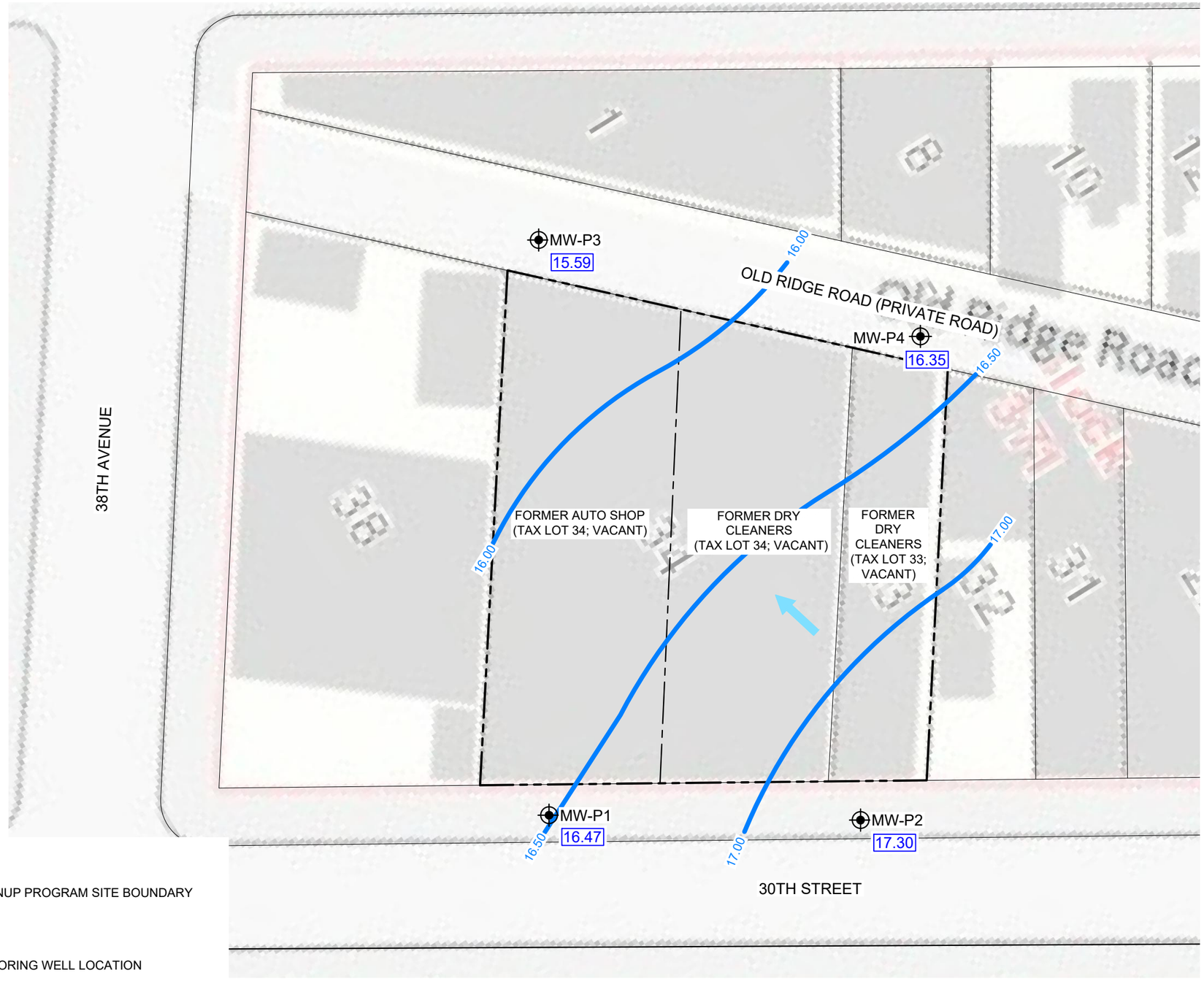

LEGEND:

- BROWNFIELD CLEANUP PROGRAM SITE BOUNDARY
- TAX LOT LINE
- PERMANENT MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (ESTIMATED)
- 15.9 GROUNDWATER ELEVATION (FEET)
- GROUNDWATER FLOW DIRECTION

SOURCE:

1. PLAN BASED ON MAP BY NYS OASIS.

0 30 60

SCALE: 1" = 30'

Site Management Plan
37-24 & 37-28 30th Street Redevelopment Site
Long Island City, New York

31ST AVENUE ASSOCIATES LLC &
37-26 30TH AVENUE LLC
NEW HYDE PARK, NEW YORK

GEI Consultants

GROUNDWATER CONTOUR MAP (FIRST QUARTER 2021)

Project 1800522 | December 2021 | Fig. 4

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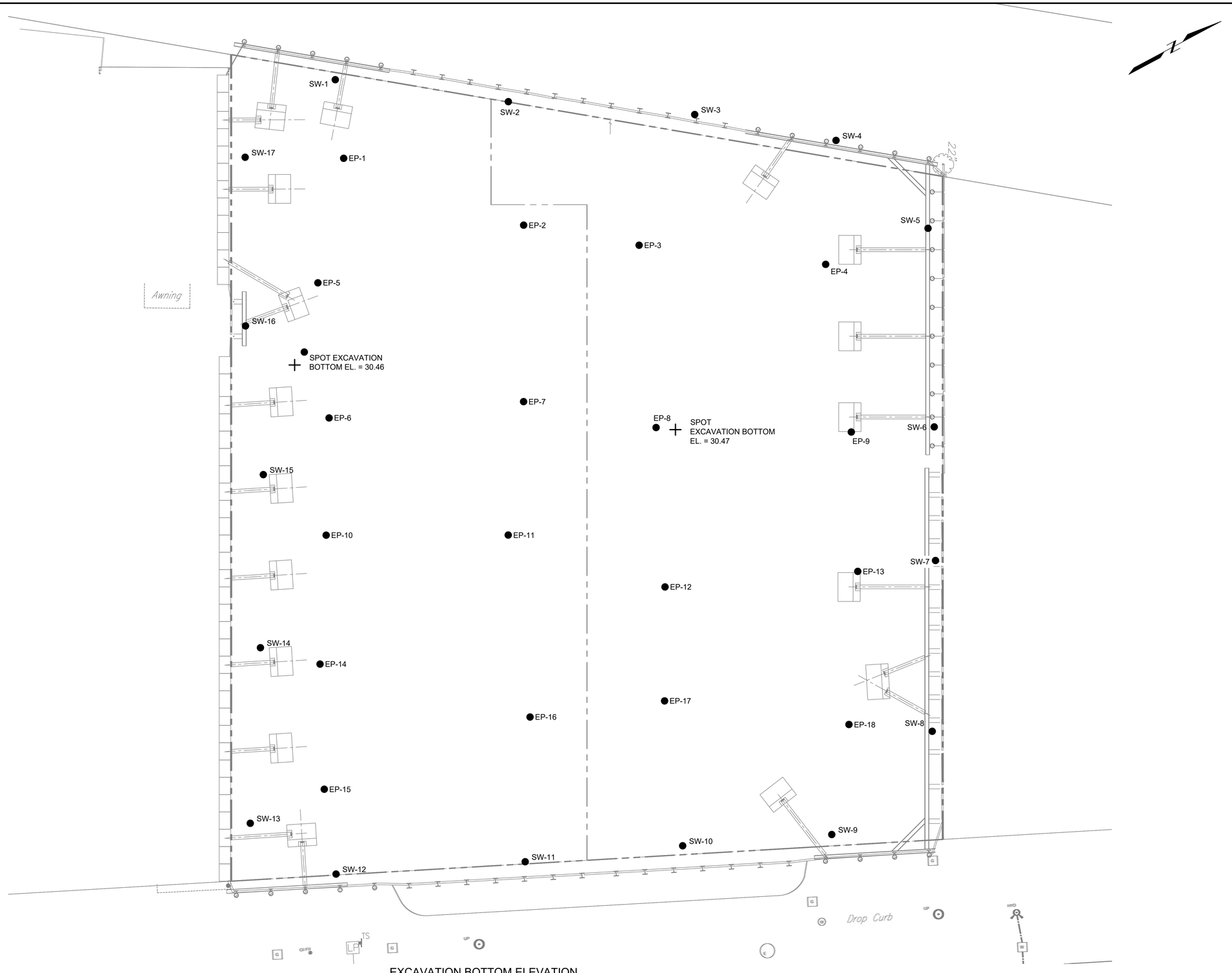

LEGEND:

● ENDPOINT SOIL SAMPLE

EXCAVATION BOTTOM ELEVATION AND ENDPOINT SAMPLE LOCATIONS

SCALE: 1/8" = 1'-0"

0 8 16

SCALE, FEET

Site Management Plan 37-24 & 37-28 30th Street Redevelopment Site Long Island City, New York	GEI Consultants	EXCAVATION BOTTOM ELEVATION AND ENDPOINT SAMPLE LOCATIONS
31st Avenue Associates LLC & 37-26 30th Avenue LLC New Hyde Park, New York	Project 1800522	December 2021 Fig. 5

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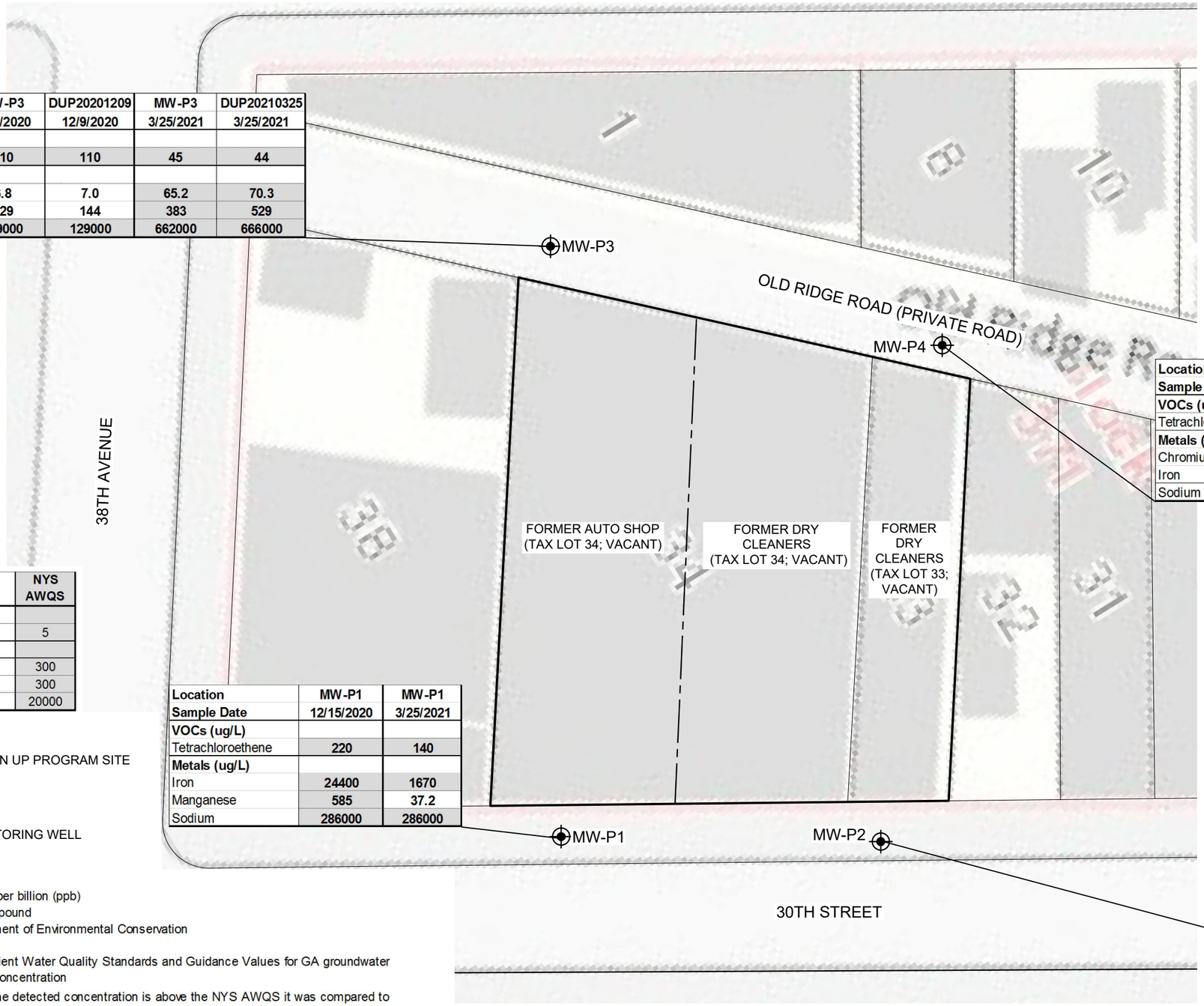


Location	MW-P3	DUP20201209	MW-P3	DUP20210325
Sample Date	12/9/2020	12/9/2020	3/25/2021	3/25/2021
VOCs (ug/L)				
Tetrachloroethene	110	110	45	44
Metals (ug/L)				
Chromium	6.8	7.0	65.2	70.3
Iron	129	144	383	529
Sodium	119000	129000	662000	666000

Location	MW-P4	MW-P4
Sample Date	12/9/2020	3/29/2021
VOCs (ug/L)		
Tetrachloroethene	21	25
Metals (ug/L)		
Chromium	8.2	98.9
Iron	85.4	344
Sodium	126000	137000

Location	MW-P1	MW-P1
Sample Date	12/15/2020	3/25/2021
VOCs (ug/L)		
Tetrachloroethene	220	140
Metals (ug/L)		
Iron	24400	1670
Manganese	585	37.2
Sodium	286000	286000

Location	MW-P2	MW-P2
Sample Date	12/15/2020	3/29/2021
VOCs (ug/L)		
Tetrachloroethene	32	31
Metals (ug/L)		
Iron	5780	3250
Manganese	194	545
Sodium	60700	39900

Analyte	NYS AWQS
VOCs (ug/l)	
Tetrachloroethene	5
Metals (ug/L)	
Iron	300
Manganese	300
Sodium	20000

LEGEND:

BROWNFIELD CLEAN UP PROGRAM SITE BOUNDARY

TAX LOT LINE

MW-P1 PERMANENT MONITORING WELL LOCATION

Notes
ug/L = micrograms per liter or parts per billion (ppb)
SVOC = Semi-Volatile Organic Compound
NYSDEC = New York State Department of Environmental Conservation
VOC = Volatile Organic Compound
NYS AWQS = New York State Ambient Water Quality Standards and Guidance Values for GA groundwater
Bolding indicates a detected result concentration
Shading and bolding indicates that the detected concentration is above the NYS AWQS it was compared to

NA = Not Analyzed
J = The result is an estimated value.
U = The result was not detected above the reporting limit.
UJ = The results was not detected at or above the reporting limit shown and the reporting limit is estimated.
* = Laboratory Control Sample is outside acceptance limits
B = Compound was found in the blank and sample.

0 30 60
SCALE: 1" = 30'

SOURCE:
1. PLAN BASED ON MAP BY NYS OASIS.

Site Management Plan
37-24 & 37-28 30th Street Redevelopment Site
Long Island City, New York

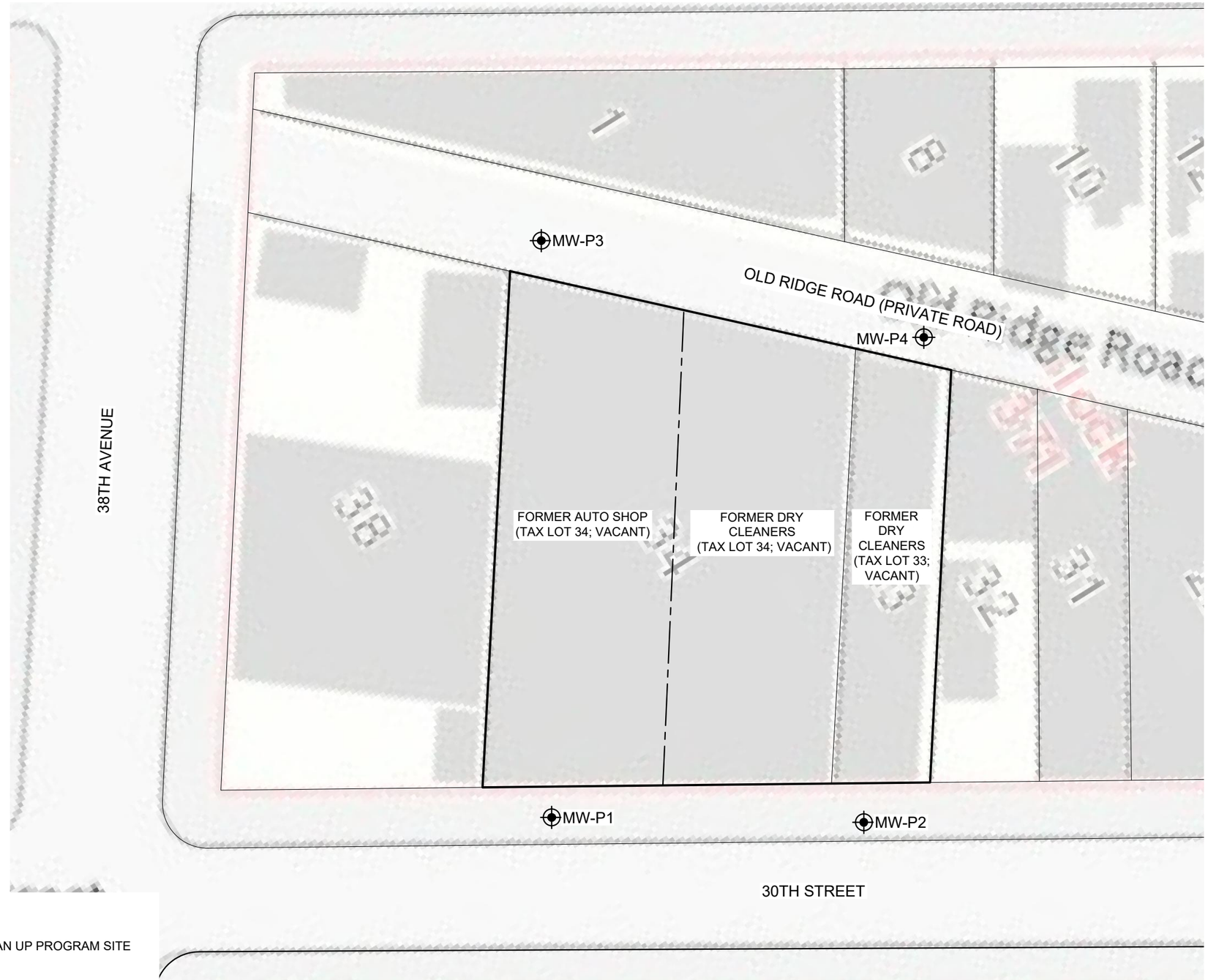
31ST AVENUE ASSOCIATES LLC &
37-26 30TH AVENUE LLC
NEW HYDE PARK, NEW YORK

GEI Consultants

GROUNDWATER EXCEEDANCES (PRE- AND POST-ISCO)

Project 1800522 | December 2021 | Fig. 6

\\hts1v-pzcc- \\hts1v-pzcc-01\HTS-DATA\Tech\Environmental Projects\Park Construction\CAD\Figures\SMP\6 1800522_SMP.dwg - 4/22/2021



LEGEND:

- BROWNFIELD CLEAN UP PROGRAM SITE BOUNDARY
- TAX LOT LINE
- MW-P1 PERMANENT MONITORING WELL LOCATION

SOURCE:

1. PLAN BASED ON MAP BY NYS OASIS.

0 30 60

SCALE: 1" = 30'

STATE OF NEW YORK
MARY A. ROZAK
No. 056744
LICENSED PROFESSIONAL ENGINEER

Site Management Plan
37-24 & 37-28 30th Street Redevelopment Site
Long Island City, New York

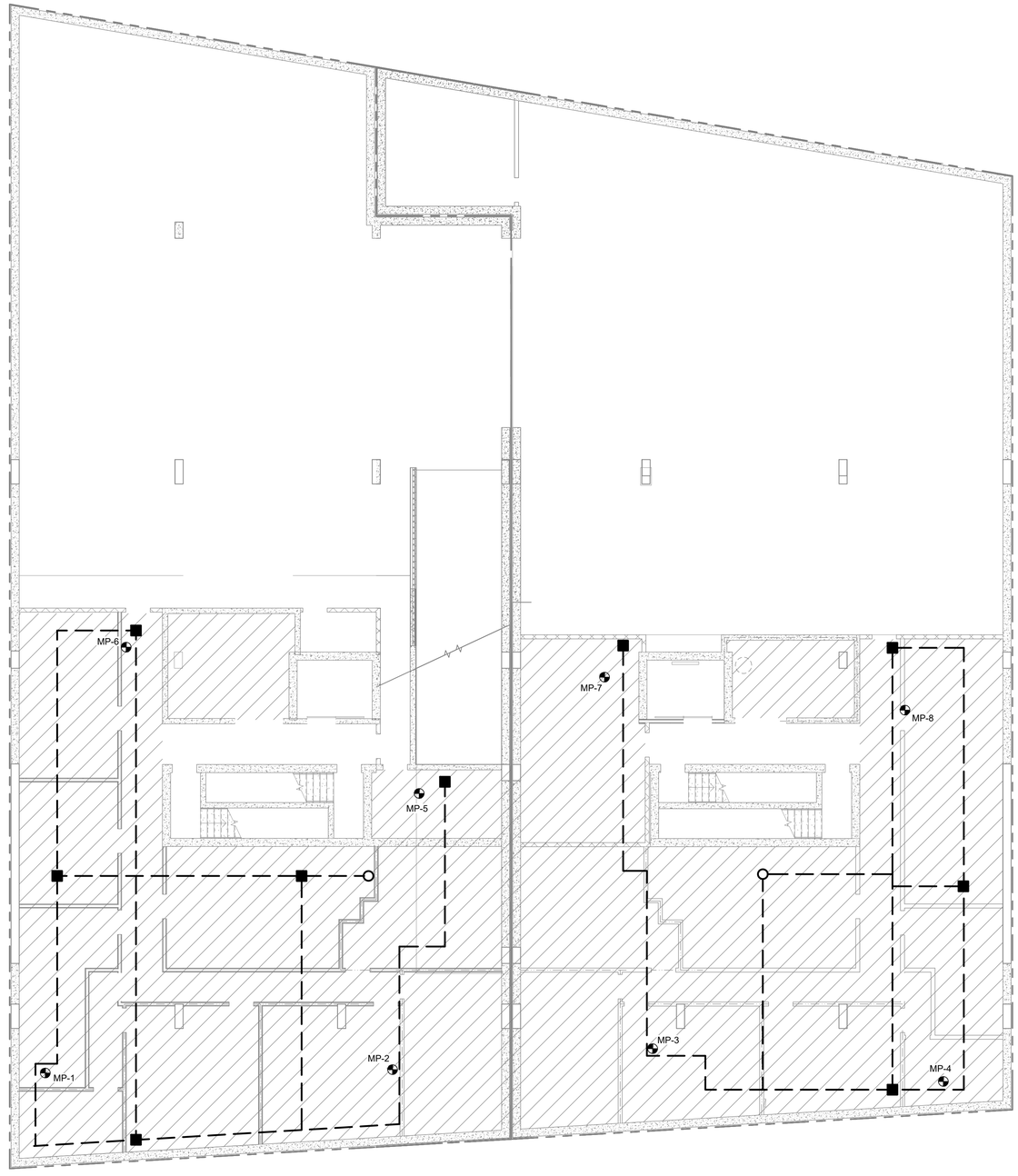
31ST AVENUE ASSOCIATES LLC &
37-26 30TH AVENUE LLC
NEW HYDE PARK, NEW YORK

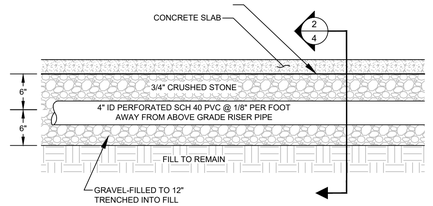
GEI Consultants

PERMANENT MONITORING WELL LOCATIONS

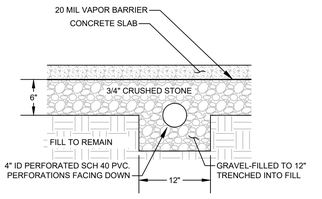
Project 1800522 | December 2021 | Fig. 7

\\hts1v-pzcc- \\hts1v-pzcc-01\HTS-DATA\Tech\Environmental Projects\Park Construction\CAD\Figures\SMP\7 1800522_SMP.dwg - 4/22/2021

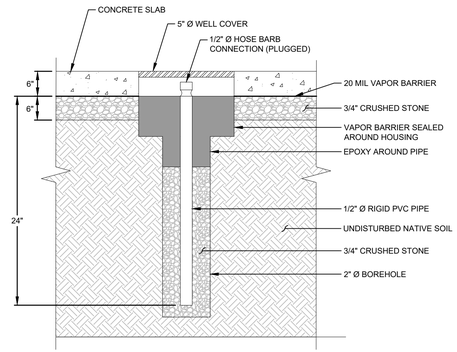




DETAIL 1 / 4B
TYPICAL TRENCH CROSS SECTION
NOT TO SCALE



DETAIL 2 / 4B
TYPICAL TRENCH DETAIL
NOT TO SCALE



DETAIL 3 / 4B
TYPICAL VAPOR MONITORING POINT
NOT TO SCALE

LEGEND:

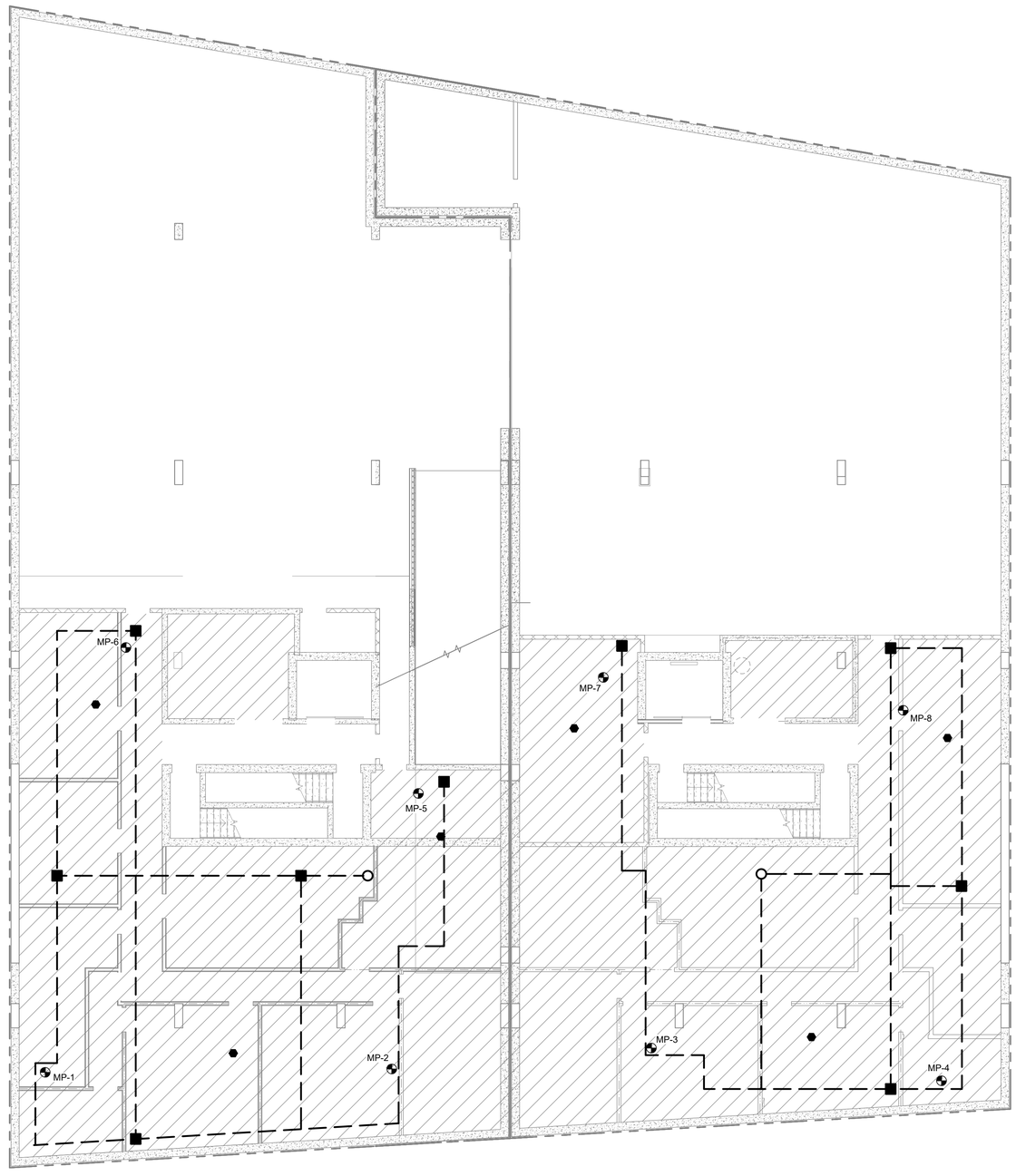
- MP-1 — SSDS MONITORING POINT
- SSDS PIPING - 4" SCH 40 PVC PERFORATED VENT PIPE
- CLEANOUT
- 3 INCH GALVANIZED STEEL VENT TO ROOF WITH IN-LINE VENT FAN
- AREA SERVED BY SSDS

AS-BUILT SUB-SLAB DEPRESSURIZATION SYSTEM

SCALE: 1/8" = 1'-0"

0 8 16
SCALE, FEET

Site Management Plan 37-24 & 37-28 30th Street Redevelopment Site Long Island City, New York	GEI Consultants	AS-BUILT SUB-SLAB DEPRESSURIZATION SYSTEM
31st Avenue Associates LLC & 37-26 30th Avenue LLC New Hyde Park, New York	Project 1800522	December 2021 Fig. 8



LEGEND:

- MP-1 — SSDS MONITORING POINT
- SSDS PIPING - 4" SCH 40 PVC PERFORATED VENT PIPE
- CLEANOUT
- 3 INCH GALVANIZED STEEL VENT TO ROOF WITH IN-LINE VENT FAN
- AREA SERVED BY SSDS
- PROPOSED POST-MITIGATION INDOOR AIR SAMPLE

AS-BUILT SUB-SLAB DEPRESSURIZATION SYSTEM

SCALE: 1/8" = 1'-0"

0 8 16
SCALE, FEET

Site Management Plan
37-24 & 37-28 30th Street Redevelopment Site
Long Island City, New York

31st Avenue Associates LLC & 37-26 30th Avenue LLC
New Hyde Park, New York

GEI Consultants

PROPOSED POST-MITIGATION INDOOR AIR SAMPLE LOCATIONS

Project 1800522 | December 2021 | Fig. 9

APPENDIX A

Environmental Easement, Survey Map, and Metes & Bounds

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument.The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.

2021102500923001002EF6F1

RECORDING AND ENDORSEMENT COVER PAGE **PAGE 1 OF 10**

Document ID: 2021102500923001 Document Date: 09-14-2021 Preparation Date: 11-04-2021
Document Type: EASEMENT
Document Page Count: 9

PRESENTER:
CHICAGO TITLE INSURANCE COMPANY
711 THIRD AVE, 8TH FLOOR
CT21-80116-Q (CES)
NEW YORK, NY 10017
212-880-1453
CTINYRECORDING@CTT.COM

RETURN TO:
BROWN DUKE & FOGEL, P.C.
JAMES K. WARD, ESQ.
350 FIFTH AVE., SUITE 4640
NEW YORK, NY 10118

PROPERTY DATA

Borough	Block	Lot		Unit	Address
QUEENS	371	33	Entire Lot		37-24 30TH STREET

Property Type: OTHER

Borough	Block	Lot		Unit	Address
QUEENS	371	34	Entire Lot		37-28 30TH STREET

Property Type: OTHER

CROSS REFERENCE DATA

CRFN_____ *or* DocumentID_____ *or* _____ Year_____ Reel____ Page_____ *or* File Number_____

PARTIES

GRANTOR/SELLER:
37-26 30TH STREET LLC
C/O: ROBERT CERRONE, 1836 GILFORD AVENUE
NEW HYDE PARK, NY 11040

GRANTEE/BUYER:
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :

Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	85.00
Affidavit Fee:	$	0.00

Filing Fee: $ 100.00

NYC Real Property Transfer Tax: $ 0.00

NYS Real Estate Transfer Tax: $ 0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 11-08-2021 13:25
City Register File No.(CRFN): **2021000441699**

City Register Official Signature

C721-80116-9

County: Queens Site No: C241214 Brownfield Cleanup Agreement Index : C241214-08-13

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made as of th 14th day of September, 2021, between Owner, 37-26 30th Street LLC, having an office at c/o Robert Cerrone, 1836 Gilford Avenue, New Hyde Park, New York 11040 (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the addresses of 37-24 30th Street and 37-28 30th Street in the City of New York, County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel numbers: Block 371 Lots 33 and 34, respectively, being the same as that property conveyed to Grantor by deed dated August 16, 2018 and recorded in the City Register of the City of New York as CRFN # 2018000352411. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.370 +/- acres, and is hereinafter more fully described in the Land Title Survey dated July 2, 2021 prepared by David A. Shaw, L.L.S. of Erlandsen-Crowell & Shaw, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C241214-08-13, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining

contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation

Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against

the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C241214
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the

recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

37-26 30th Street LLC:

By: _____

Print Name: Robert Cerrone

Title: Managing member Date: 9/7/21

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Queens)

On the 7th day of September in the year 2021, before me, the undersigned, personally appeared Robert Cerrone, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Maria Luisa Cerrone
Notary Public - State of New York

MARIA LUISA CERRONE
NOTARY PUBLIC, STATE OF NEW YORK
Registration No. 01CE6118001
Qualified in Queens County
Commission Expires November 1, 2024

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Michael J. Ryan, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 14th day of September in the year 2021, before me, the undersigned, personally appeared Michael J. Ryan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

Dale L. Thiel
Notary Public, State of New York
Qualified in Columbia County
No 01TH6414394
Commission Expires February 2/20/2025

SCHEDULE "A" PROPERTY DESCRIPTION

BLOCK 371 LOTS 33 & 34

ALL that certain plot, piece or parcel of land, with the building and improvements thereon erected, situate, lying and being in the Borough of Queens City and State of New York and more particularly bounded and described as follows:

BEGINNING at a point on the northwesterly side of 30th Street (1st Avenue) distant 70 feet 4 inches northeasterly from the corner formed by the northwesterly side of 30th Street with the northeasterly side of 38th Avenue, (Freeman Avenue);

RUNNING THENCE northeasterly on a line forming an interior angle of 86 degrees 38 minutes 30 seconds with the northwesterly side of 30th Street a distance of 143 feet 3-5/8 inches to the southeasterly side of Old Ridge Road;

THENCE northeasterly along the southeasterly side of Old Ridge Road 125.1 feet (Tax Map 125.08 feet);

THENCE southeasterly along a line forming an exterior angle of 86 degrees 40 minutes 13 seconds with the northwesterly side of 30th Street 114.95 feet to the northwesterly side of 30th Street; and;

RUNNING THENCE southwesterly along the northwesterly side of 30th Street 123.54 feet to the point or place of BEGINNING.

Being approximately 0.370 acres more or less.

Said premises being commonly known as 37-24 30th Street and 37-26 30th Street, Long Island City, New York

THE PROPERTY IS COVERED BY BCP SITE # C241214

ENVIRONMENTAL EASEMENT AREA ACCESS

THE DEC OR THEIR AGENT MAY ACCESS THE ENVIRONMENTAL EASEMENT AREA AS SHOWN HEREON THROUGH ANY EXISTING STREET ACCESS OR BUILDING INGRESS/EGRESS ACCESS POINT.

THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL EASEMENT HELD BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION PURSUANT TO TITLE 36 OF ARTICLE 71 OF THE NEW YORK ENVIRONMENTAL CONSERVATION LAW.

THE ENGINEERING AND INSTITUTIONAL CONTROLS FOR THE EASEMENT ARE SET FORTH IN MORE DETAIL IN THE SITE MANAGEMENT PLAN ("SMP"). A COPY OF THE SMP MUST BE OBTAINED BY ANY PARTY WITH AN INTEREST IN THE PROPERTY. THE SMP MAY BE OBTAINED FROM THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF ENVIRONMENTAL REMEDIATION, SITE CONTROL SECTION, 625 BROADWAY, ALBANY, NY 12233 OR AT derweb@gw.dec.state.ny.us.

BROWNFIELD SITE &
ENVIRONMENTAL EASEMENT AREA

ENVIRONMENTAL EASEMENT DESCRIPTION

ALL that certain plot piece or parcel of land situate lying and being in the Borough and county of Queens, City and State of New York bounded and described as follows:

BEGINNING at a point on the westerly side of 30th. Street, distant 70.33 feet northerly from the corner formed by the intersection of the northerly side of 38th Avenue and the westerly side of 30th Street;

THENCE westerly, parallel with 38th Avenue 143.30 feet to the easterly side of Old Ridge Road;

THENCE northerly along Old Ridge Road 125.13 feet;

THENCE easterly, parallel with 38th Avenue 114.95 feet to the westerly side of 30th. Street;

THENCE southerly along 30th Street 123.55 feet to the point or place of BEGINNING.

The above described parcel has an area of 15,926 square feet or 0.37 acres.

DESCRIPTION TAX BLOCK 371 LOTS 33 & 34

ALL that certain plot piece or parcel of land situate lying and being in the Borough and county of Queens, City and State of New York bounded and described as follows:

BEGINNING at a point on the westerly side of 30th. Street, distant 70.33 feet northerly from the corner formed by the intersection of the northerly side of 38th Avenue and the westerly side of 30th Street;

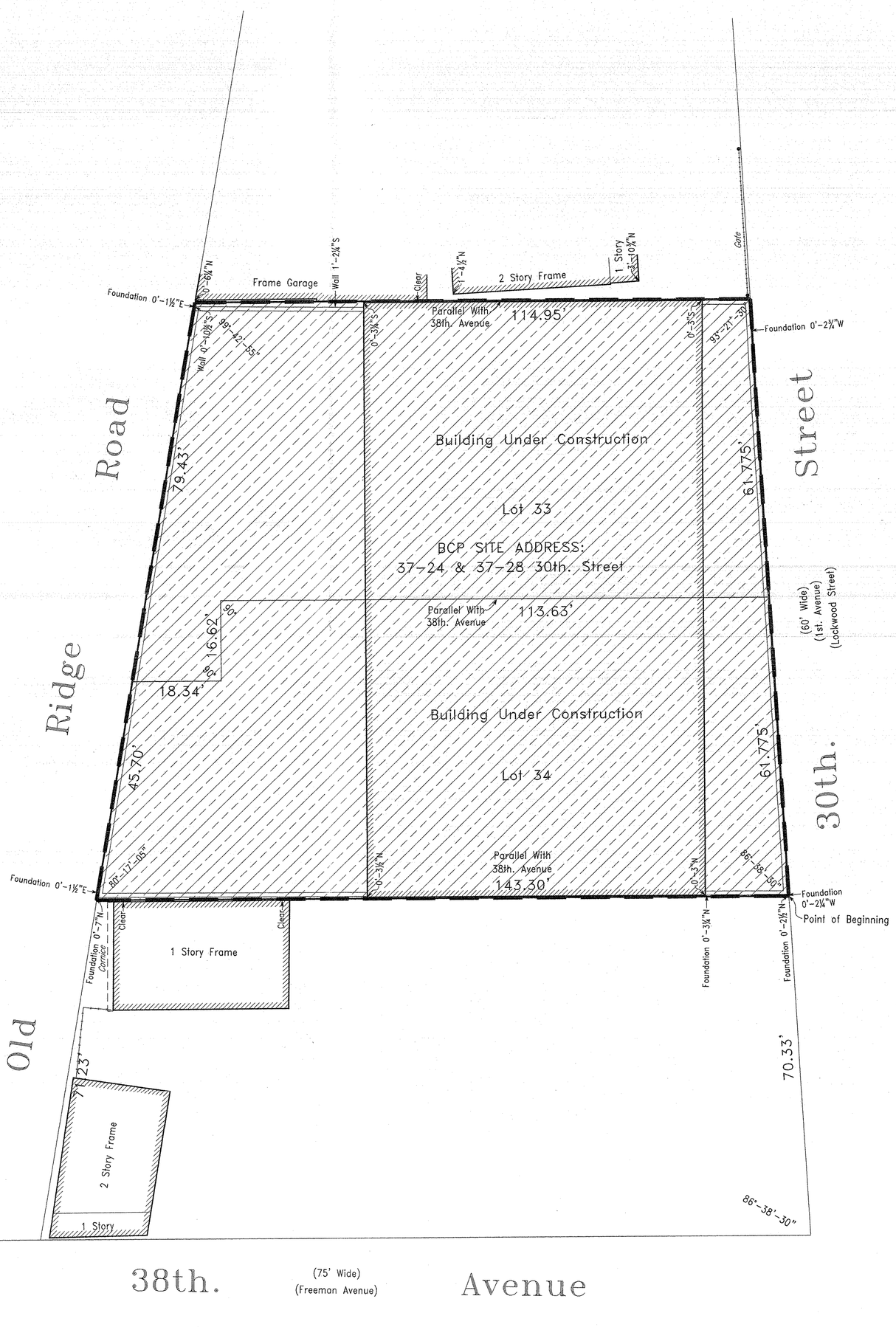
THENCE westerly, parallel with 38th Avenue 143.30 feet to the easterly side of Old Ridge Road;

THENCE northerly along Old Ridge Road 125.13 feet;

THENCE easterly, parallel with 38th Avenue 114.95 feet to the westerly side of 30th. Street;

THENCE southerly along 30th Street 123.55 feet to the point or place of BEGINNING.

The above described parcel has an area of 15,926 square feet or 0.37 acres.



DAVID SHAW
LICENSE NO. 50252
DATE OF SURVEY: JULY 2, 2021

ADDRESS: 37-24 & 37-28 30th. Street
LONG ISLAND CITY, NY 11101

TAX BLOCK 371
BOROUGH OF QUEENS, CITY OF NEW YORK

FOUNDATION LOCATION: JULY 2, 2021

Scale: 1cm.= 1.92 m.
1.92m 3.84m 5.76m 7.68m

Scale: 1"=16'
0' 16' 32'

ERLANDSEN-CROWELL & SHAW
FOUNDED IN 1852 BY E.W. CONKLIN
Civil Engineers & City Surveyors
241 JERICHO TPKE NEW HYDE PARK, NY 11040 516-326-4353 718-526-0339

Scale: 1"=16' 69613-E

APPENDIX B

Site Contacts List

Appendix B. Site Contacts List
37-24 & 37-28 30th Street Redevelopment Site
Long Island City, New York
NYSDEC BCP Site No. C241214

Contact	**Phone/Email Address**
Owner: Robert Cerrone 31st Avenue Associates LLC 1836 Gilford Avenue New Hyde Park, NY 11040 37-26 30th Street LLC 1836 Gilford Avenue New Hyde Park, NY 11040	robertcerrone.park@gmail.com
Engineer of Record: Gary Rozmus, P.E. Senior Consultant Environmental GEI Consultants, Inc. 1000 New York Ave, Suite B Huntington Station, NY 11746	(631) 479-3510 grozmus@geiconsultants.com
Consultant: Nicholas J. Recchia, P.G Senior Environmental Practice Leader Hydrogeologist GEI Consultants, Inc. 1000 New York Ave, Suite B Huntington Station, NY 11746	(631) 759-2973 nrecchia@geiconsultants.com
Environmental Attorney: George C. D. Duke, Esq., P.G. BROWN DUKE & FOGEL, P.C. 350 Fifth Ave, Suite 4640 New York, New York 10118	646-915-0236 gduke@bdflegal.com

NYSDEC Project Manager: Steve Walsh Assistant Engineer (Environmental) Bureau B, Section B Division of Environmental Remediation New York State Department of Environmental Conservation 625 Broadway Albany, NY 12233	(518) 402-9824 Steven.Walsh@dec.ny.gov
NYSDEC DER Section Chief: William Bennett Bureau B, Section B Division of Environmental Remediation New York State Department of Environmental Conservation 625 Broadway, 12th Floor, Albany, NY 12233	(518) 402-9659 william.bennett@dec.ny.gov
NYSDEC DER Bureau Chief: Gerard Burke Remedial Bureau B Director Division of Environmental Remediation New York State Department of Environmental Conservation 625 Broadway, 12th Floor, Albany, NY 12233	(518) 402-9817 Gerard.burke@dec.ny.gov
NYSDOH Project Manager: Shaun J. Surani Bureau of Environmental Exposure Investigation New York State Department of Health Empire State Plaza Corning Tower, Room 1787 Albany, New York, 12237	(518) 402-1338 Shaun.Surani@health.ny.gov

APPENDIX C

Boring Logs

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-1

LOCATION: Lot 34 - Millennium Auto Collision
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/24/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 24.50 1/24/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/30	0.0		SB-1 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 5') SAND (SP); ~100% sand, fine; dry, light brown.
	5		60/45	0.0		SB-1 (5'-10')	(5'- 12.5') SAND WITH SILT (SM); ~70% sand, fine, ~30% fines; dry, light brown.
	10		60/45	0.0		SB-1 (10'-15')	
	15		60/30	0.0		SB-1 (15'-20')	(12.5'- 25') SAND (SP); ~100% sand, fine; dry, light brown.
	20		60/30	0.0		SB-1 (20'-25')	
▼	25		60/50	0.0			(25'- 30') SILT (ML); ~100% fines; very moist to wet, light brown.
	30						End of Boring at 30 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (PPM)
JHS = JAR HEADSPACE PID READING (PPM)

NA = NOT APPLICABLE
NM = NOT MEASURED
Q_P = POCKET PENETROMETER
S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT 3/22/19

GEI Consultants

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-2

LOCATION: Lot 34 - Millennium Auto Collision
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/24/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 24.00 1/24/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/23	0.0		SB-2 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 5') SILT (ML); ~100% fines; dry, dark brown, Some crushed concrete fragments..
	5		60/24	0.0		SB-2 (5'-10')	(5'- 12.5') SILT (ML); ~100% fines; dry, tan to brown.
	10		60/32	0.0		SB-2 (10'-15')	(12.5'- 15') SAND (SP); ~100% sand, fine to medium; dry, brown.
	15		60/40	0.0		SB-2 (15'-20')	(15'- 20') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	20		60/45	0.0		SB-2 (20'-25')	(20'- 24') SILT WITH SAND (MLS); ~70% fines, ~30% sand, fine; dry, light brown.
▼							(24'- 25') SILT (ML); ~100% fines; moist to very moist, light brown.
	25		60/60	0.0			(25'- 30') SILT (ML); ~100% fines; wet, light brown.
	30						End of Boring at 30 feet.

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NM = NOT MEASURED
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S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT 3/22/19

GEI Consultants

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-3

LOCATION: Lot 34 - Enterprise Cleaners
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/25/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 26.50 1/25/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	SOIL / BEDROCK DESCRIPTION
	0		60/45	0.0		(0'- 0.25') CONCRETE. (0.25'- 5') SILT (ML); ~100% fines; dry, light brown.
	5		60/45	0.0		(5'- 6') SILTY SAND (SM); ~70% sand, fine, ~30% fines; dry, light brown. (6'- 11') SILT (ML); ~100% fines; dry, dark brown.
	10		60/25	0.0		(11'- 25') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	15		60/35	0.0		
	20		60/35	0.0		
	25		60/40	0.0		(25'- 26') SAND WITH SILT (SP-SM); ~90% sand, fine, ~10% fines; dry, light brown. (26'- 30') SILT (ML); ~100% fines; moist to wet, light brown.
▼	30					End of Boring at 30 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (PPM)
JHS = JAR HEADSPACE PID READING (PPM)

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NM = NOT MEASURED
Q_P = POCKET PENETROMETER
S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ GINT DATA TEMPLATE EXAMPLE.GDT 3/22/19

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-4

LOCATION: Lot 34 - Millennium Auto Collision
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/25/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 27.50 1/25/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/30	0.0		SB-4 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 5') SILT WITH SAND (ML); ~90% fines, ~10% sand, fine sand; dry, light brown.
	5		60/45	0.0		SB-4 (5'-10')	(5'- 6') SAND (SP); ~100% sand, fine; dry, light brown to gray. (6'- 10') SILT (ML); ~100% fines; dry, light brown.
	10		60/30	0.0		SB-4 (10'-15')	(10'- 11') SILT (ML); ~100% fines; wet, light brown. (11'- 25') SAND (SP); ~100% sand, fine to medium sand; dry, light brown.
	15		60/45	0.0		SB-4 (15'-20')	
	20		60/30	0.0		SB-4 (20'-25')	
▼	25		60/30	0.0		SB-4 (25'-30')	(25'- 26') SAND WITH SILT (SP-SM); ~90% sand, fine, ~10% fines; dry, light brown. (26'- 30') SILT (ML); ~100% fines; dry, light brown. (27'- 30') SILT (ML); ~100% fines; very moist to wet, light brown.
	30						End of Boring at 30 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
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JHS = JAR HEADSPACE PID READING (PPM)

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NM = NOT MEASURED
Q_P = POCKET PENETROMETER
S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

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OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT_3/22/19

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-5

LOCATION: Lot 34 - Enterprise Cleaners
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/28/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 24.50 1/25/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/45	0.0		SB-5 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 1.5') SAND WITH SILT (SP-SM); ~90% sand, fine, ~10% fines; dry, dark brown. (1.5'- 5') SILT (ML); ~90% fines, ~10% gravel, subangular; max. gravel size 0.25, dry, light brown.
	5		60/40	0.0		SB-5 (5'-10')	(5'- 7.5') SAND (SP-SM); ~90% sand, fine, ~10% fines; dry, light brown. (7.5'- 10') SILT (ML); ~100% fines; dry, dark brown.
	10		60/35	0.0		SB-5 (10'-15')	(10'- 25') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	15		60/30	0.0		SB-5 (15'-20')	
	20		60/30	0.0		SB-5 (20'-25')	
▼	25		60/35	0.0			(25'- 30') SAND WITH SILT (SP-SM); ~90% sand, fine, ~10% fines; moist to wet, dark brown.
	30						End of Boring at 30 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
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NM = NOT MEASURED
Q_P = POCKET PENETROMETER
S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT 3/22/19

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-6

LOCATION: Lot 34 - Enterprise Cleaners
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/25/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 27.00 1/25/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/30	0.0		SB-5 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 5') SAND WITH SILT (SP-SM); ~80% sand, fine, ~20% fines; dry, light brown.
	5		60/45	0.0		SB-5 (5'-10')	(5'- 6.5') SAND (SP); ~100% sand, fine; dry, dark brown. (6.5'- 10') SAND WITH SILT (SP-SM); ~90% sand, fine, ~10% fines; dry, dark brown.
	10		60/30	0.0		SB-5 (10'-15')	(10'- 11') SAND (SP); ~100% sand, fine; dry, dark brown. (11'- 20') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	15		60/30	0.0		SB-5 (15'-20')	
	20		60/35	0.0		SB-5 (20'-25')	(20'- 25') SILTY SAND (SM); ~70% sand, fine, ~30% fines; dry, brown to tan.
▼	25		60/60	0.0		SB-5 (25'-30')	(25'- 26.5') SILT (ML); ~100% fines; dry, light brown. (26.5'- 30') SILT (ML); ~100% fines; wet to wet, light brown to gray.
	30						End of Boring at 30 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
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NM = NOT MEASURED
Q_P = POCKET PENETROMETER
S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
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ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT 3/22/19

GEI Consultants

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-7

LOCATION: Lot 34 - Millennium Auto Collision
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/24/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 27.00 1/24/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/6	0.0		SB-7 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 5') SAND (SP); ~100% sand, fine; dry, light brown.
	5		60/35	0.0		SB-7 (5'-10')	(5'- 10') SILTY SAND (SM); ~70% sand, fine, ~30% fines; dry, light brown.
	10		60/25	0.0		SB-7 (10'-15')	(10'- 11') SILT (ML); ~100% fines; dry, light brown. (11'- 27') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	15		60/30	0.0		SB-7 (15'-20')	
	20		60/30	0.0		SB-7 (20'-25')	
	25		60/40	0.0			
	▼						(27'- 30') SILT (ML); ~100% fines; moist to wet, dark brown.
	30						End of Boring at 30 feet.

NOTES:

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IN. = INCHES
FT. = FEET

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PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT_3/22/19

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-8

LOCATION: Lot 34 - Millennium Auto Collision
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/24/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 24.50 1/24/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/12	0.0		SB-8 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 2.5') SAND (SP); ~100% sand, fine; dry, light brown. (2.5'- 5') SAND WITH SILT (SP-SM); ~90% sand, fine, ~10% fines; dry, dark brown.
	5		60/48	0.0		SB-8 (5'-10')	(5'- 7.5') SAND (SP); ~100% sand, fine; dry, brown to tan. (7.5'- 10') SILT WITH SAND (MLS); ~70% fines, ~30% sand, fine; dry, brown to tan.
	10		60/40	0.0		SB-8 (10'-15')	(10'- 17.5') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	15		60/35	0.0		SB-8 (15'-20')	(17.5'- 20') SAND WITH SILT (SP-SM); ~90% sand, fine, ~10% fines; dry, light brown.
	20		60/55	0.0		SB-8 (20'-25')	(20'- 25') SILT (ML); ~100% fines; dry, light brown.
▼	25		60/60	0.0			(25'- 30') SILT (ML); ~100% fines; moist to wet, light brown.
	30						End of Boring at 30 feet.

NOTES:

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Q_P = POCKET PENETROMETER
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IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
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TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT 3/22/19

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-9

LOCATION: Lot 34 - Enterprise Cleaners
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/24/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 27.50 1/25/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/40	0.0		SB-9 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 5') SAND WITH SILT (SW-SM); ~90% sand, fine, ~10% fines; dry, light brown.
	5		60/40	0.0		SB-9 (5'-10')	(5'- 8') SILT WITH SAND (ML); ~90% fines, ~10% sand, fine; dry, light brown. (8'- 10.5') SILT (ML); ~100% fines; dry, light brown.
	10		60/30	0.0		SB-9 (10'-15')	(10.5'- 25') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	15		60/30	0.0		SB-9 (15'-20')	
	20		60/30	0.0		SB-9 (20'-25')	
▼	25		60/30	0.0		SB-9 (25'-30')	(25'- 26.5') SILTY SAND (SM); ~70% sand, fine, ~30% fines; dry, light brown. (26.5'- 30') SILTY SAND (SM); ~70% sand, fine, ~30% fines; moist to wet, light brown.
	30						End of Boring at 30 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (PPM)
JHS = JAR HEADSPACE PID READING (PPM)

NA = NOT APPLICABLE
NM = NOT MEASURED
Q_P = POCKET PENETROMETER
S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT 3/22/19

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-10

LOCATION: Lot 34 - Enterprise Cleaners
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/25/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 24.00 1/25/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/45	0.0		SB-10 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 5') SAND WITH SILT (SW-SM); ~90% sand, fine, ~10% fines; dry, light brown.
	5		60/40	0.0		SB-10 (5'-10')	(5'- 6') SAND (SP); ~100% sand, fine; dry, light brown. (6'- 12') SILT (ML); ~100% fines; dry, brown to tan.
	10		60/30	0.0		SB-10 (10'-15')	
	15		60/45	0.0		SB-10 (15'-20')	(12'- 25.5') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	20		60/35	0.0		SB-10 (20'-25')	
▼	25		60/35	0.0			(25.5'- 30') SAND (SP); ~100% sand, fine to medium; moist to wet, light brown.
	30						End of Boring at 30 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (PPM)
JHS = JAR HEADSPACE PID READING (PPM)

NA = NOT APPLICABLE
NM = NOT MEASURED
Q_P = POCKET PENETROMETER
S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT_3/22/19

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-11

LOCATION: Lot 33 - Season Wash
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/28/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 24.00 1/28/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/25	0.0		SB-11 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 6.5') SAND WITH SILT AND GRAVEL (SP-SM); ~85% sand, fine, ~10% fines, ~5% gravel; dry, light brown.
	5		60/45	0.0		SB-11 (5'-10')	(6.5'- 8.5') SILTY SAND (SM); subangular, ~70% sand, fine, ~30% fines; max. gravel size 0.25, dry, brown. (8.5'- 11') SILT (ML); fine, ~100% fines; dry, light brown.
	10		60/44	0.0		SB-11 (10'-15')	(11'- 12') SAND WITH SILT (SP-SM); ~90% sand, fine, ~10% fines; dry, light brown. (12'- 14') SILT (ML); ~100% fines; very moist, light brown.
	15		60/40	0.0		SB-11 (15'-20')	(14'- 25.5') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	20		60/40	0.0		SB-11 (20'-25')	
▼	25						(25.5'- 30') SAND (SP); ~100% sand, fine to medium; moist to wet, light brown.
	30						End of Boring at 30 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (PPM)
JHS = JAR HEADSPACE PID READING (PPM)

NA = NOT APPLICABLE
NM = NOT MEASURED
Q_P = POCKET PENETROMETER
S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT 3/22/19

GEI Consultants

GEI Consultants, Inc.
110 Walt Whitman Rd.
Huntington Station, NY 11746
631-760-9300

CLIENT: Park Construction
PROJECT: 30th Street Redevelopment Site
CITY/STATE: Queens, New York
GEI PROJECT NUMBER: 1800522

BORING LOG
PAGE 1 of 1
SB-12

LOCATION: Lot 33 - Season Wash
NORTHING (FT): _____ **EASTING (FT):** _____
TOTAL DEPTH (FT): 30.0
DRILLED BY: LAWES / Kevin McGourty
DATUM VERT. / HORZ.: _____
LOGGED BY: Bill Fitchett
DATE START / END: 1/28/2019
DRILLING DETAILS: Geoprobe / 7822DT
WATER LEVEL DEPTHS (FT): ▼ 26.50 1/28/2019
GENERAL NOTE: _____

ELEV. FT.	DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN/REC IN./IN.	SAMPLE INFO: PID (PPM)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	0		60/25	0.0		SB-12 (0'-5')	(0'- 0.25') CONCRETE. (0.25'- 3') SILTY SAND (SM); ~70% sand, fine, ~30% fines; dry, light brown.
							(3'- 6') SILT (ML); ~100% fines; dry, dark brown.
	5		60/40	0.0		SB-12 (5'-10')	(6'- 8') SILTY SAND (SM); ~70% sand, fine, ~30% fines; dry, light brown.
							(8'- 10') SILT (ML); ~100% fines; dry, light brown.
	10		60/45	0.0		SB-12 (10'-15')	(10'- 12') SILTY SAND (SM); ~70% sand, ~30% fines; dry, dark brown.
							(12'- 26.5') SAND (SP); ~100% sand, fine to medium; dry, light brown.
	15		60/30	0.0		SB-12 (15'-20')	
	20		60/30	0.0		SB-12 (20'-25')	
	25		60/30	0.0		SB-12 (25'-30')	
▼							(26.5'- 30') SAND (SP); ~100% sand; moist to wet, light brown.
	30						End of Boring at 30 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (PPM)
JHS = JAR HEADSPACE PID READING (PPM)

NA = NOT APPLICABLE
NM = NOT MEASURED
Q_P = POCKET PENETROMETER
S_V = TORVANE PEAK

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG_WITH WELL_30TH STREET REDEVELOPMENT SITE BORING LOGS.GPJ_GINT DATA TEMPLATE EXAMPLE.GDT 3/22/19

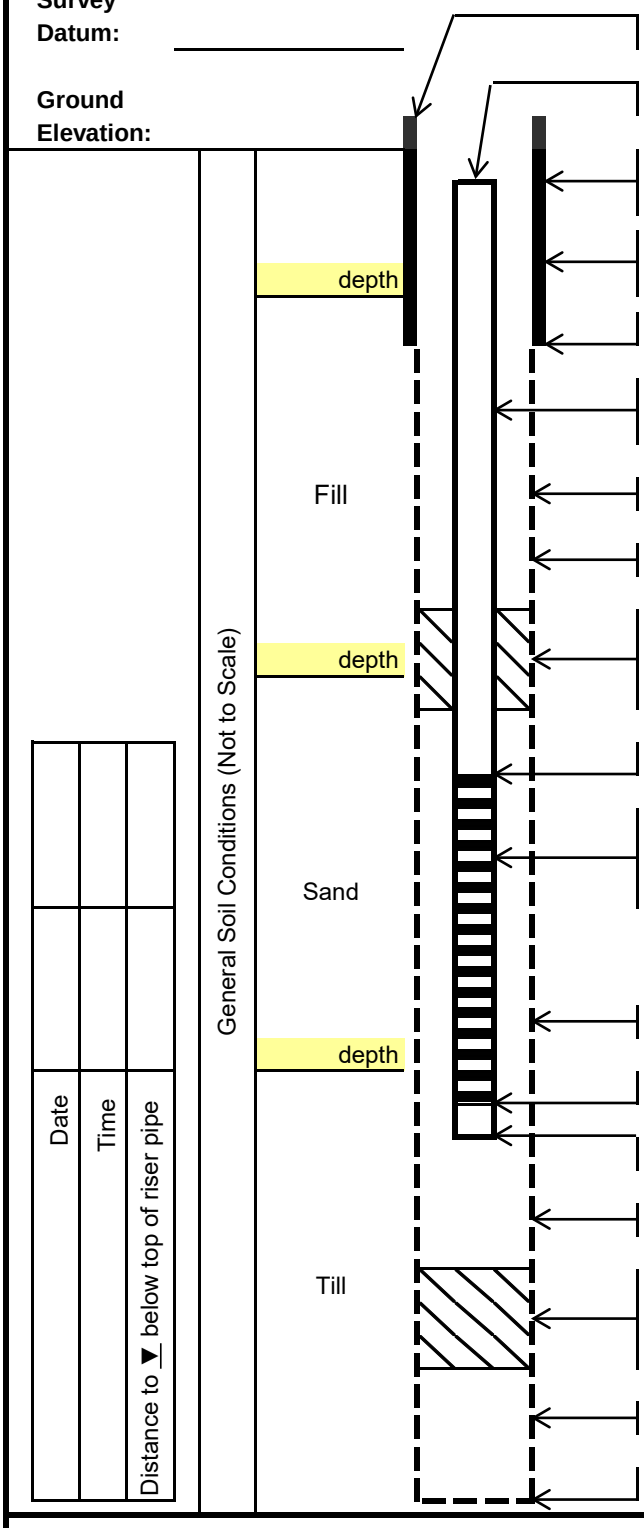
Groundwater Well Installation Log

Well ID: MW-1S

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34 Former Millennium Auto Collision
Client	Park Construction		
Contractor	LAWES		
Driller	Kevin	**GEI Rep.** B. Fitchett	**Install Date** 1/29/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	3-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	24-feet
Depth Top of Screened Section	25-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes:

GEI Consultants

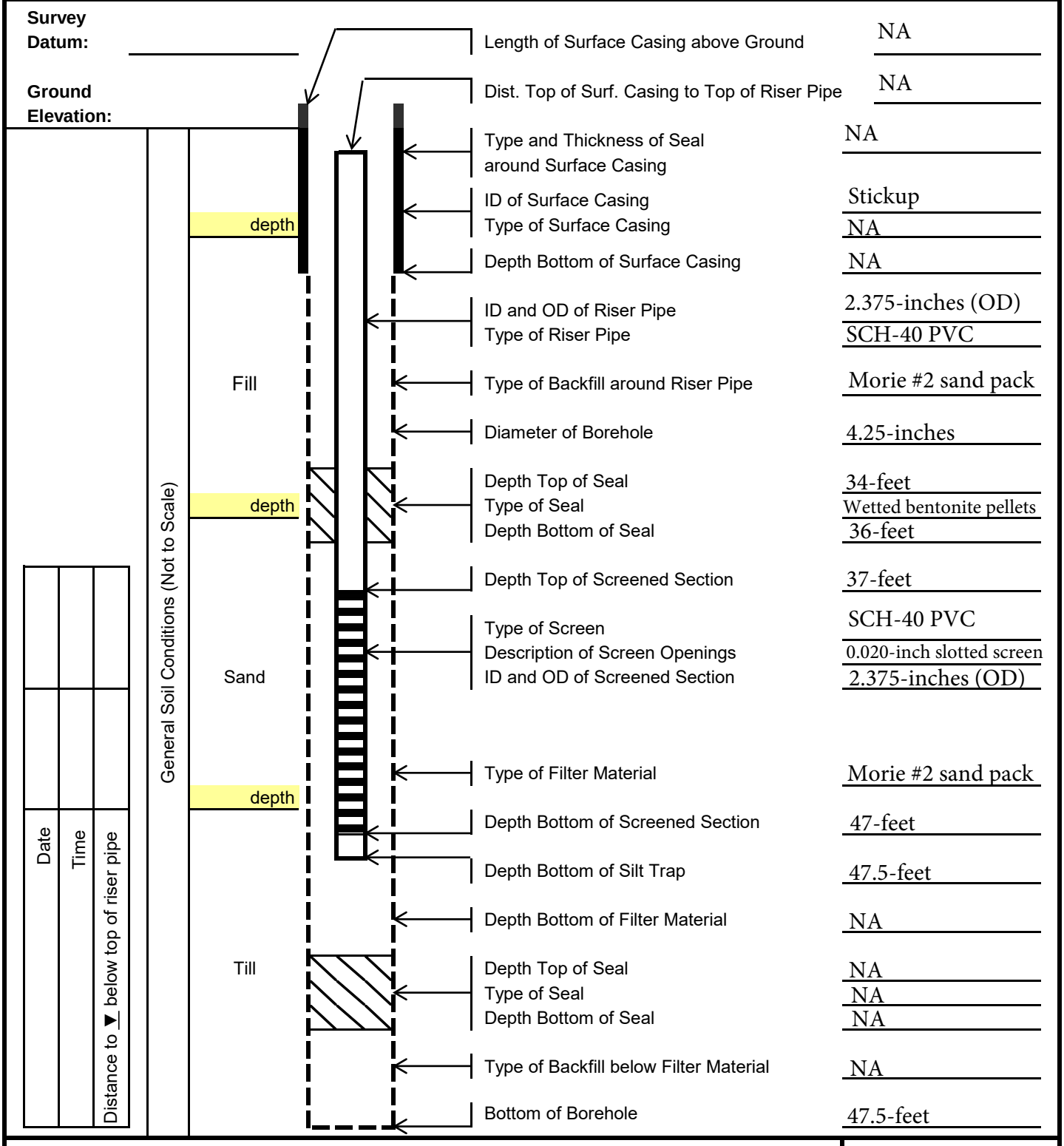
Groundwater Well Installation Log

Well ID: MW-1I

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Former Millenium Auto Collision
Contractor	Cascade		
Driller	Kevin	**GEI Rep.** B. Fitchett	**Install Date** 2/5/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	34-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	36-feet
Depth Top of Screened Section	37-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	47-feet
Depth Bottom of Silt Trap	47.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	47.5-feet

Notes:

GEI Consultants

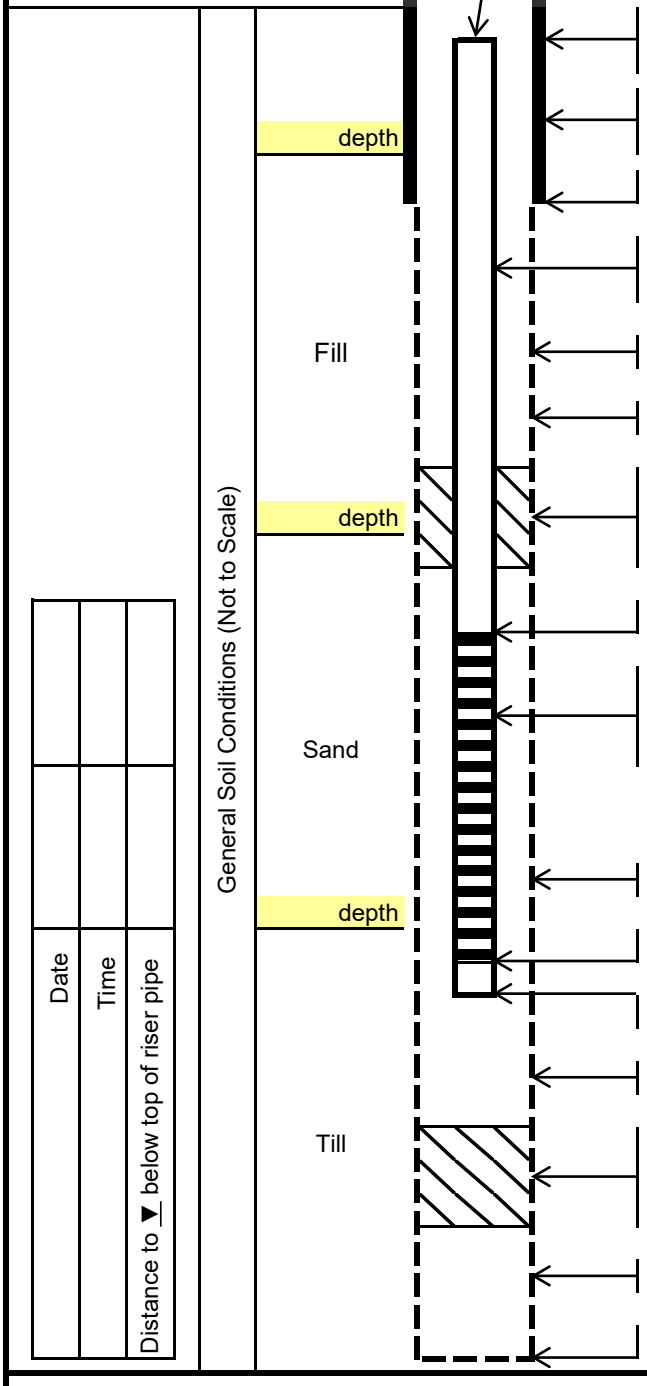
Groundwater Well Installation Log

Well ID: MW-2S

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Millennium Auto Collision
Contractor	LAWES		
Driller	Kevin	**GEI Rep.** B. Fitchett	**Install Date** 1/28/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	24-feet
Depth Top of Screened Section	25-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes:

GEI Consultants

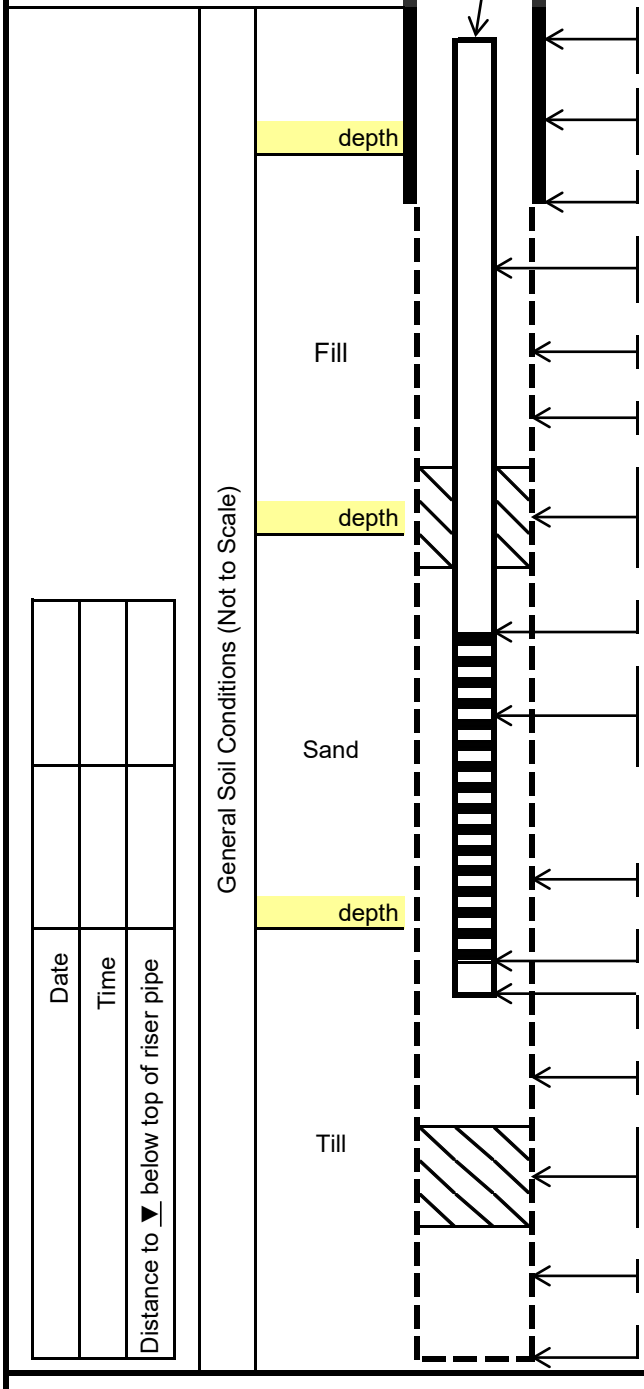
Groundwater Well Installation Log

Well ID: MW-2I

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Former Millennium Auto Collision
Contractor	LAWES		
Driller	Kevin	**GEI Rep.** B. Fitchett	**Install Date** 2/4/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	34-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	36-feet
Depth Top of Screened Section	37-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	47-feet
Depth Bottom of Silt Trap	47.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	47.5-feet

Notes:

GEI Consultants

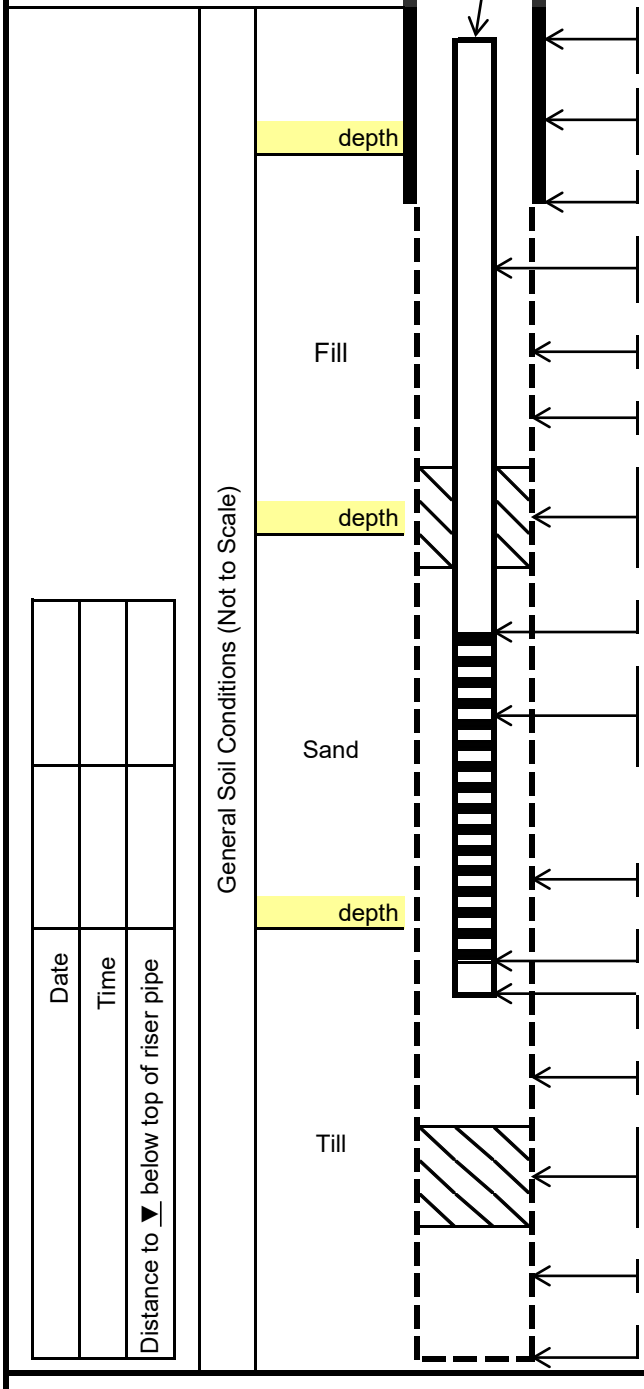
Groundwater Well Installation Log

Well ID: MW-3S

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Former Enterprise Cleaners
Contractor	LAWES		
Driller	Kevin	**GEI Rep.** B. Fitchett	**Install Date** 1/29/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	24-feet
Depth Top of Screened Section	25-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes:

GEI Consultants

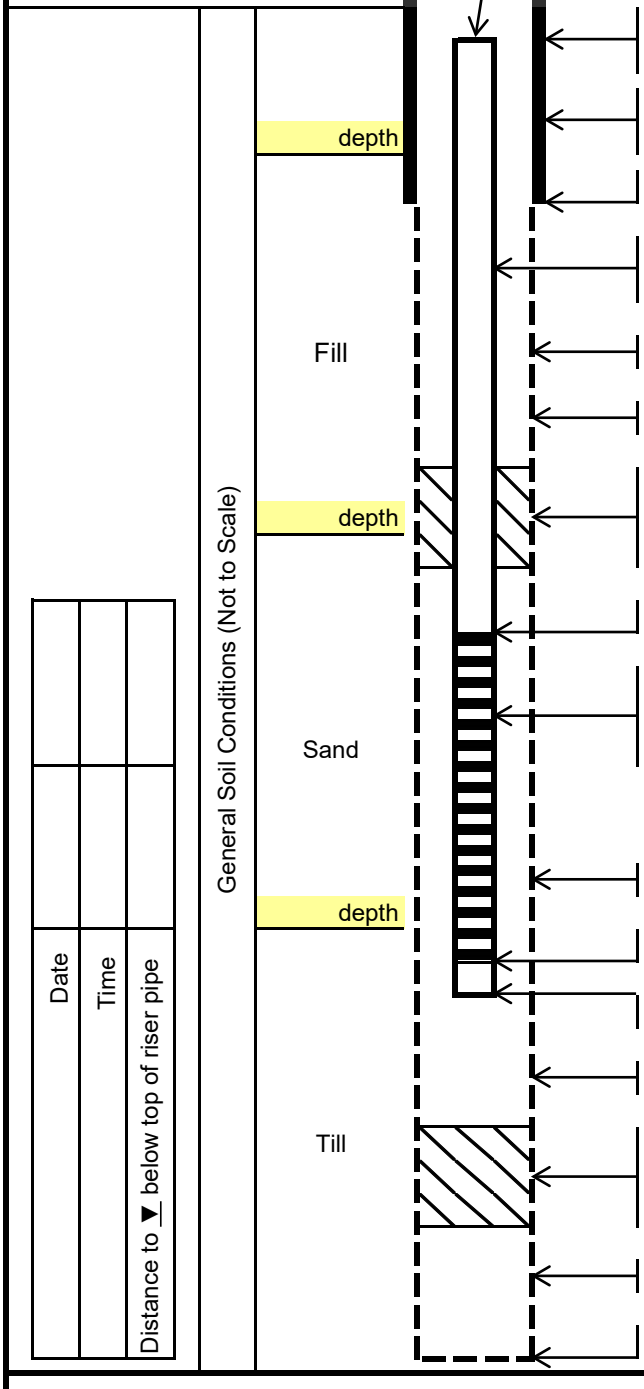
Groundwater Well Installation Log

Well ID: MW-3I

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Former Enterprise Cleaners
Contractor	Cascade		
Driller	Evan	**GEI Rep.** B. Fitchett	**Install Date** 2/14/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	37-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	39-feet
Depth Top of Screened Section	40-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	50-feet
Depth Bottom of Silt Trap	50.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	51-feet

Notes:

GEI Consultants

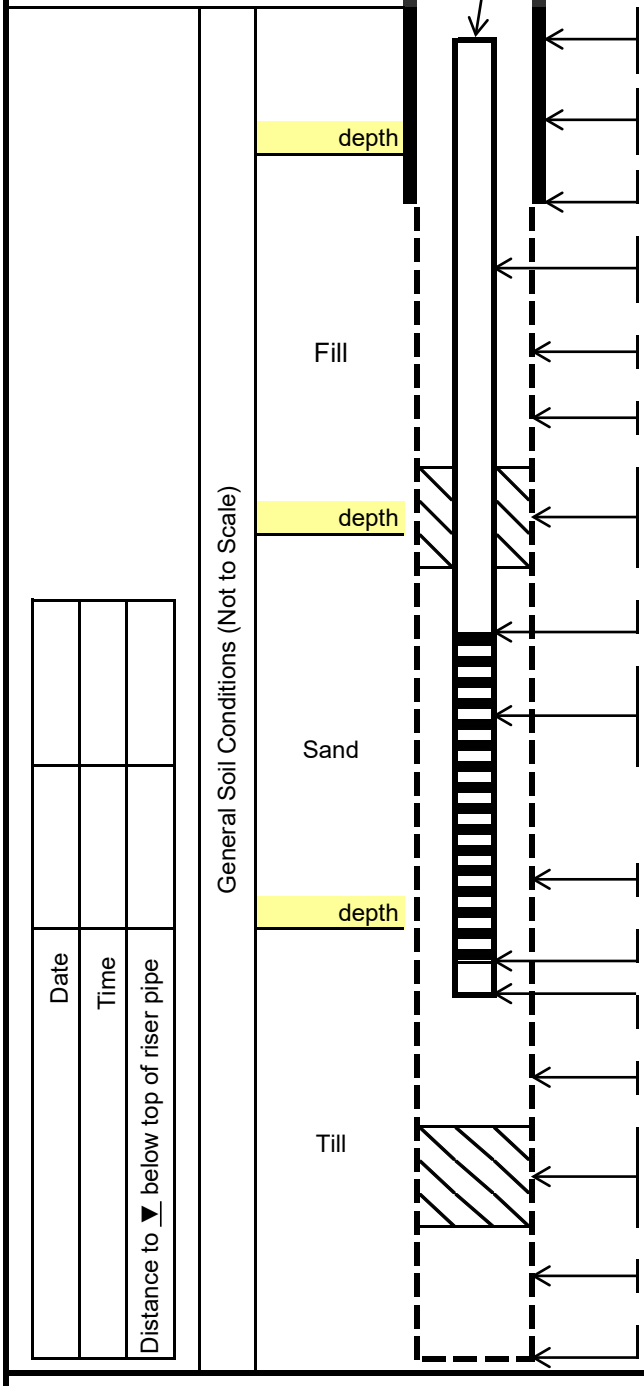
Groundwater Well Installation Log

Well ID: MW-3D

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Former Enterprise Cleaners
Contractor	Cascade		
Driller	Evan	**GEI Rep.** B. Fitchett	**Install Date** 2/13/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	55-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	57-feet
Depth Top of Screened Section	58-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	68-feet
Depth Bottom of Silt Trap	68.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	68.5-feet

Notes:

GEI Consultants

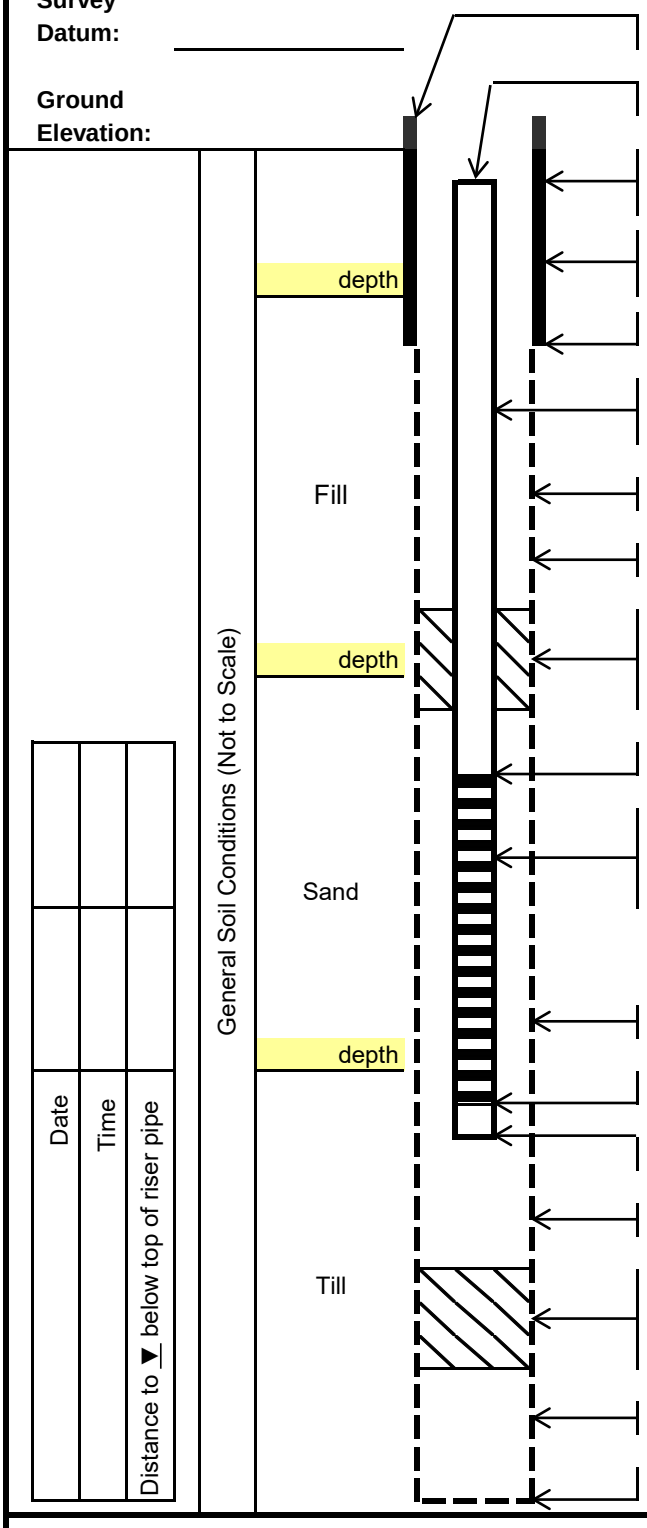
Groundwater Well Installation Log

Well ID: MW-4S

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34 Former Millennium Auto Collision
Client	Park Construction		
Contractor	Cascade		
Driller	Evan	**GEI Rep.** B. Fitchett	**Install Date** 1/28/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	24-feet
Depth Top of Screened Section	25-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes:

GEI Consultants

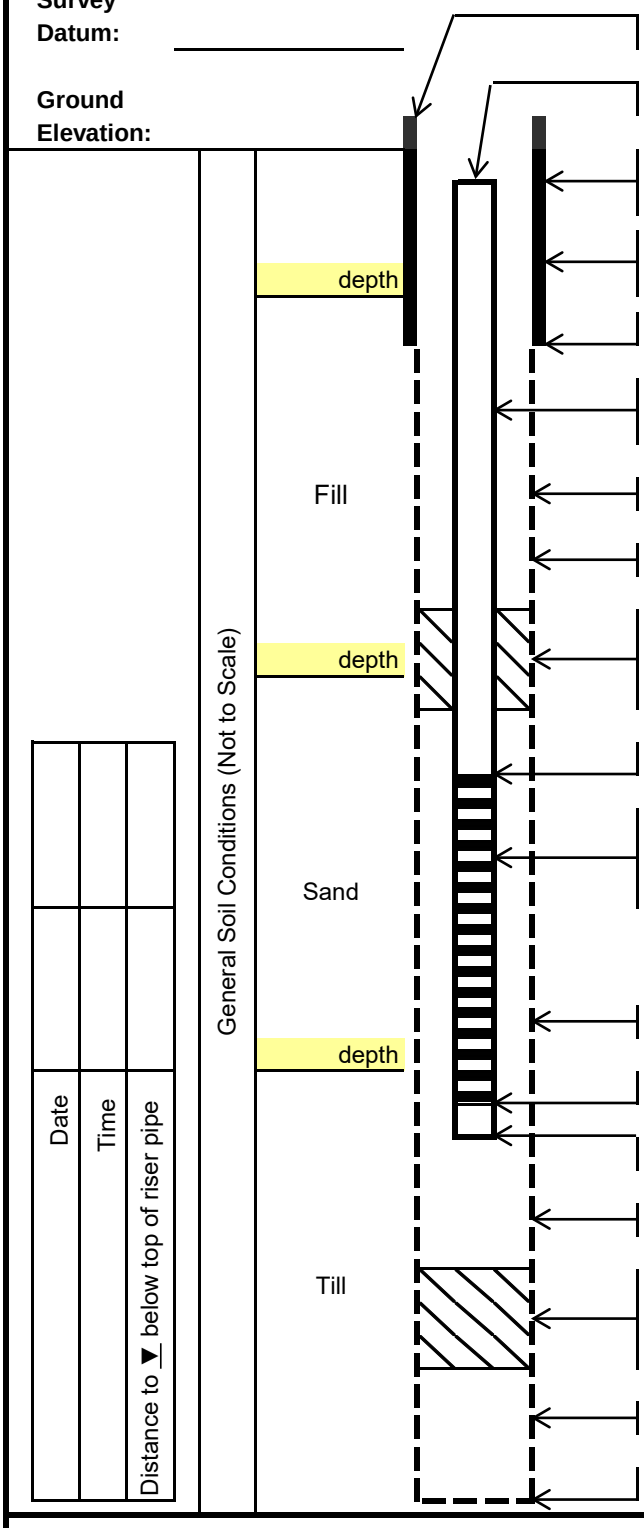
Groundwater Well Installation Log

Well ID: MW-4I

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34 Former Millennium Auto Collision
Client	Park Construction		
Contractor	Cascade		
Driller	Evan	**GEI Rep.** B. Fitchett	**Install Date** 2/12/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	39.5-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	41.5-feet
Depth Top of Screened Section	42.5-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	52.5-feet
Depth Bottom of Silt Trap	53-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	53-feet

Notes:

GEI Consultants

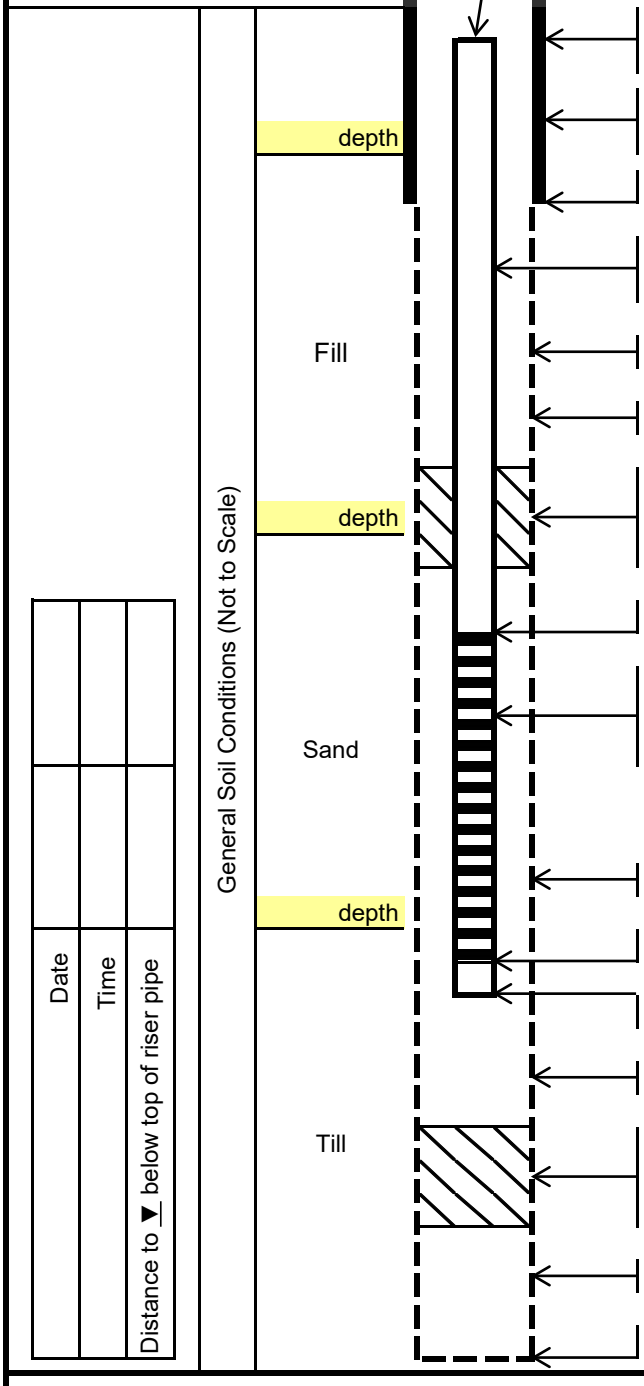
Groundwater Well Installation Log

Well ID: MW-5S

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Former Enterprise Cleaners
Contractor	LAWES		
Driller	Kevin	**GEI Rep.** B. Fitchett	**Install Date** 1/29/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	24-feet
Depth Top of Screened Section	25-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes:

GEI Consultants

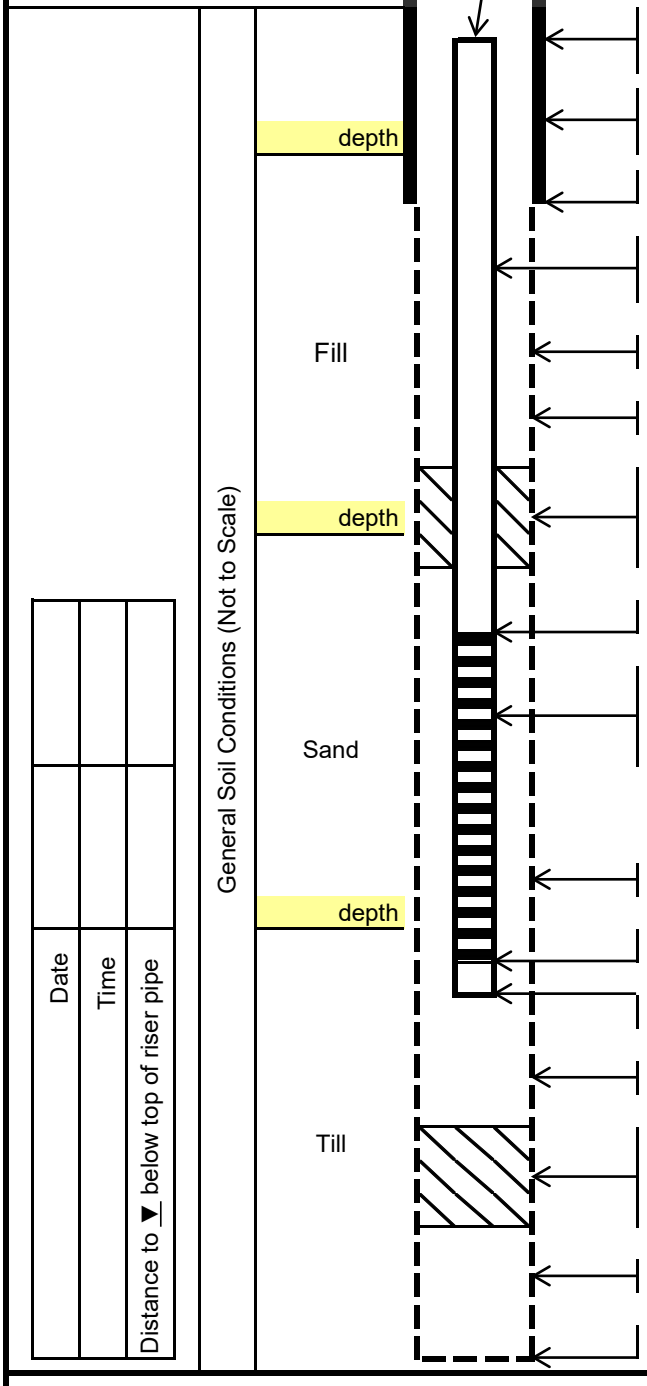
Groundwater Well Installation Log

Well ID: MW-5I

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Former Enterprise Cleaners
Contractor	LAWES		
Driller	Kevin	**GEI Rep.** B. Fitchett	**Install Date** 2/5/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	34-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	36-feet
Depth Top of Screened Section	37-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	47-feet
Depth Bottom of Silt Trap	47.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	47.5-feet

Notes:

GEI Consultants

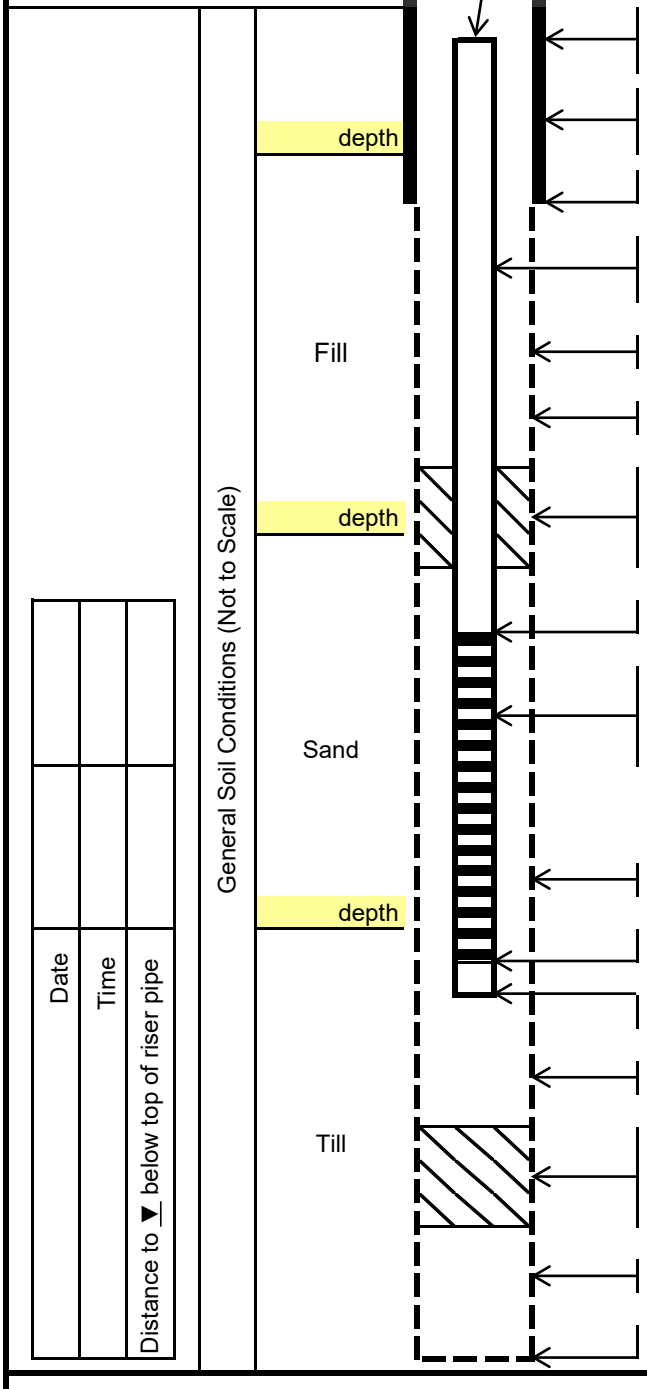
Groundwater Well Installation Log

Well ID: MW-6S

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Former Enterprise Cleaners
Contractor	LAWES		
Driller	Kevin	**GEI Rep.** B. Fitchett	**Install Date** 2/4/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	25-feet
Depth Top of Screened Section	40-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes: All shallow wells indentical; installed with casing.

GEI Consultants

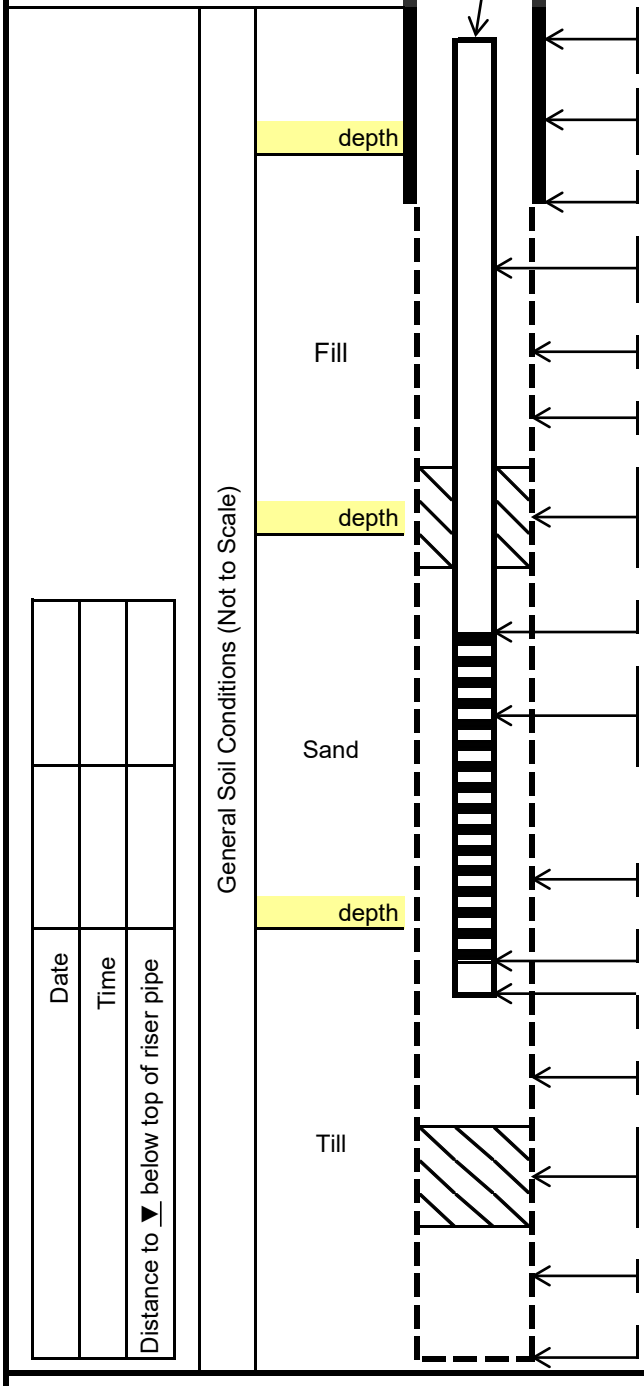
Groundwater Well Installation Log

Well ID: MW-6I

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Lot 34
Client	Park Construction		Former Enterprise Cleaners
Contractor	LAWES		
Driller	Kevin	**GEI Rep.** B. Fitchett	**Install Date** 2/4/19

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	Stickup
Type of Surface Casing	NA
Depth Bottom of Surface Casing	NA
ID and OD of Riser Pipe	2.375-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	4.25-inches
Depth Top of Seal	37-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	39-feet
Depth Top of Screened Section	40-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2.375-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	50-feet
Depth Bottom of Silt Trap	50.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	50.5-feet

Notes:

GEI Consultants

APPENDIX D

Monitoring Well Construction Logs

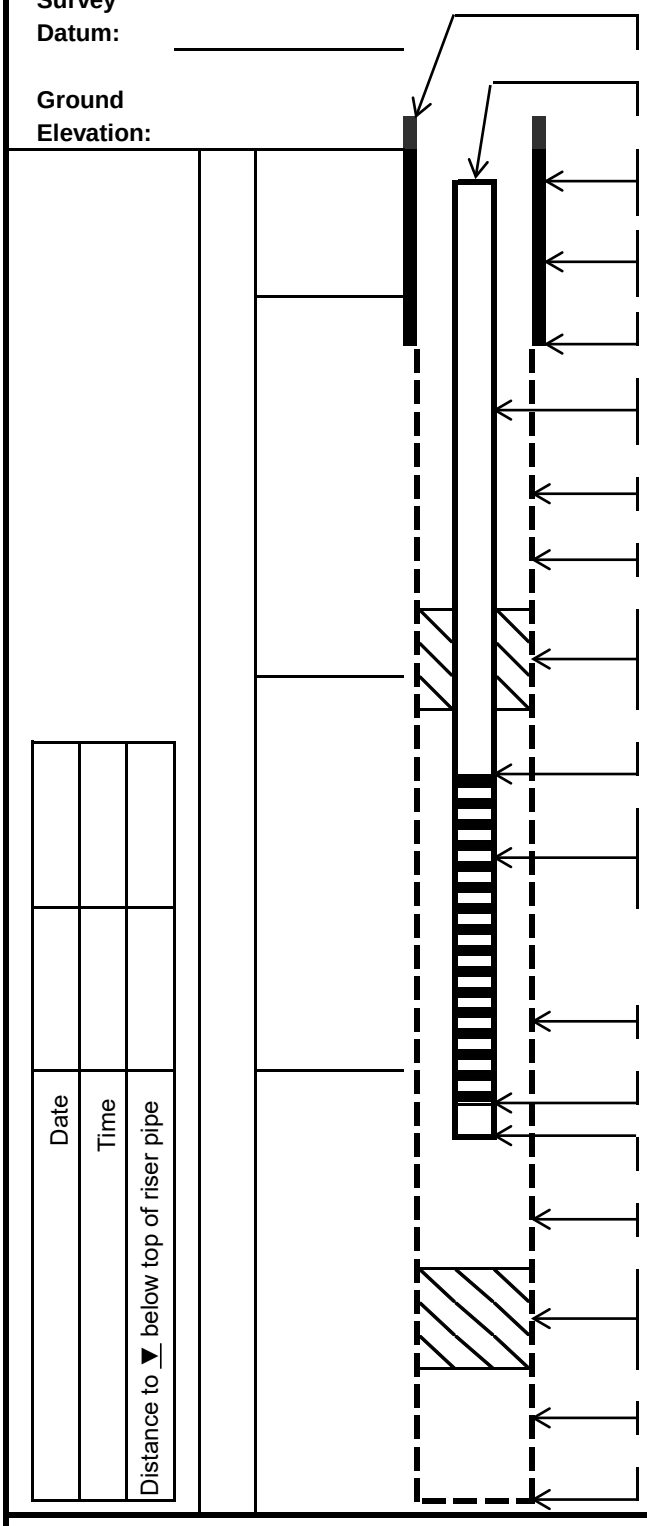
Groundwater Well Installation Log

Well ID: MW-P1

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	30th Street Sidewalk
Client	Park Construction		
Contractor	AARCO		
Driller	Tom Seickel	**GEI Rep.** Bill Fitchett	**Install Date** 11/17/20

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	Flush/NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	Concrete/6-inches
ID of Surface Casing	4" Flush Mount
Type of Surface Casing	Manhole
Depth Bottom of Surface Casing	0.5-feet
ID and OD of Riser Pipe	2-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	2 1/4-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	24-feet
Depth Top of Screened Section	25-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes:

GEI Consultants

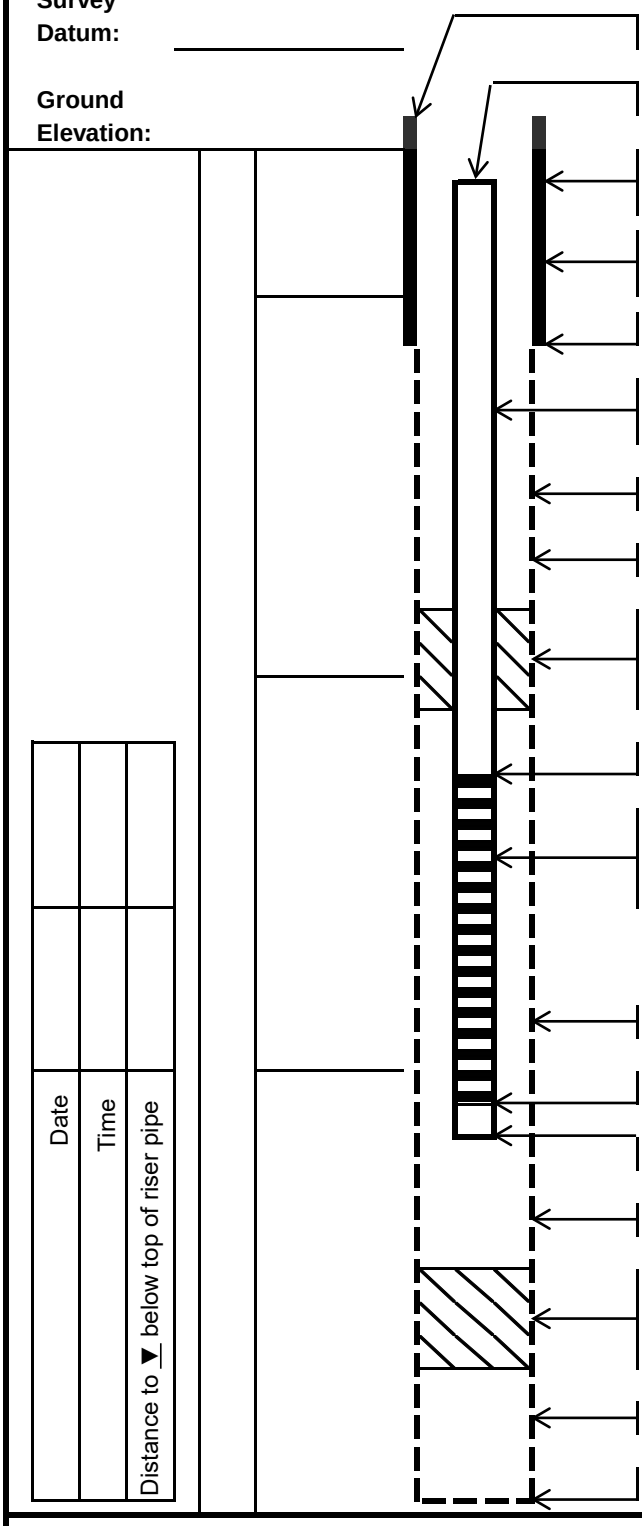
Groundwater Well Installation Log

Well ID: MW-P2

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	30th Street Sidewalk
Client	Park Construction		
Contractor	AARCO		
Driller	Tom Seickel	**GEI Rep.** Bill Fitchett	**Install Date** 11/17/20

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	Flush/NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	Concrete/6-inches
ID of Surface Casing	4" Flush Mount
Type of Surface Casing	Manhole
Depth Bottom of Surface Casing	0.5-feet
ID and OD of Riser Pipe	2-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	2 1/4-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	24-feet
Depth Top of Screened Section	25-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes:

GEI Consultants

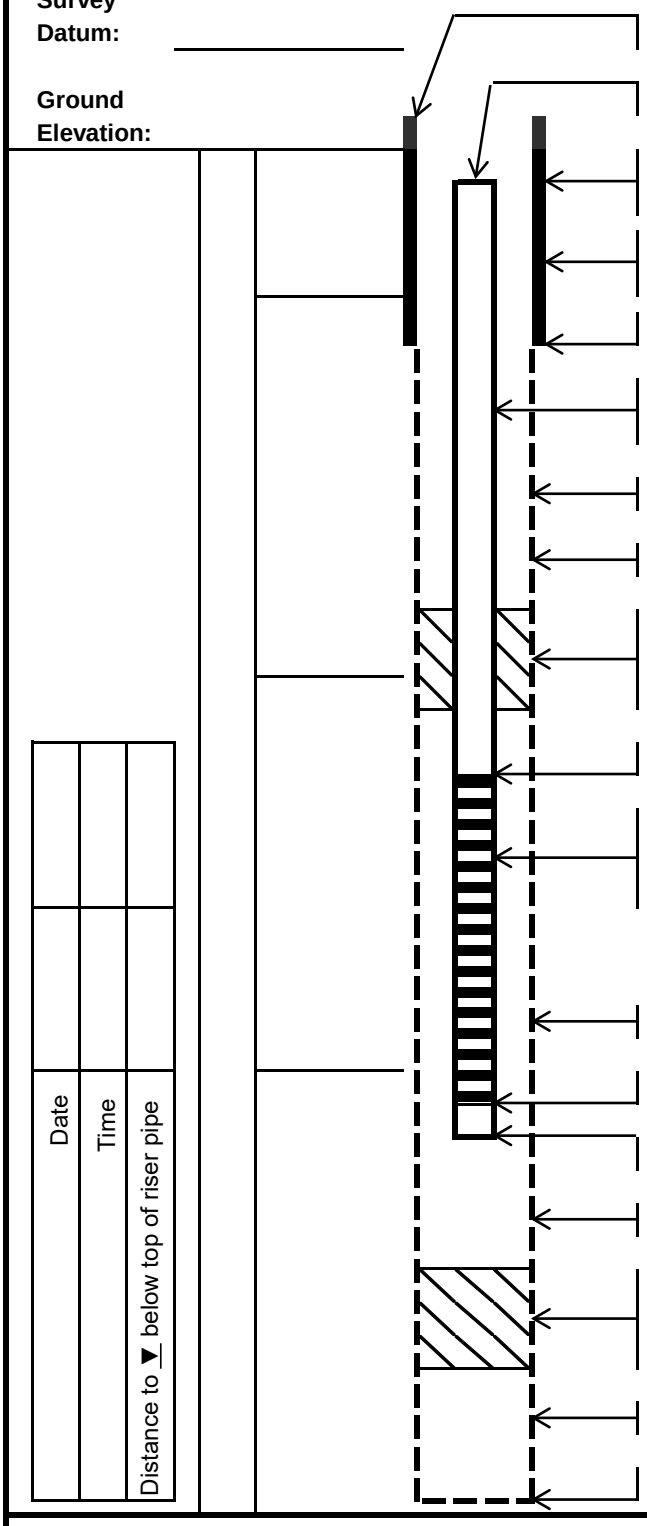
Groundwater Well Installation Log

Well ID: MW-P3

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Old Bridge Road
Client	Park Construction		
Contractor	AARCO		
Driller	Tom Seickel	**GEI Rep.** Bill Fitchett	**Install Date** 11/17/20

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	Flush/NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	Concrete/6-inches
ID of Surface Casing	4" Flush Mount
Type of Surface Casing	Manhole
Depth Bottom of Surface Casing	0.5-feet
ID and OD of Riser Pipe	2-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	2 1/4-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	24-feet
Depth Top of Screened Section	25-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes:

GEI Consultants

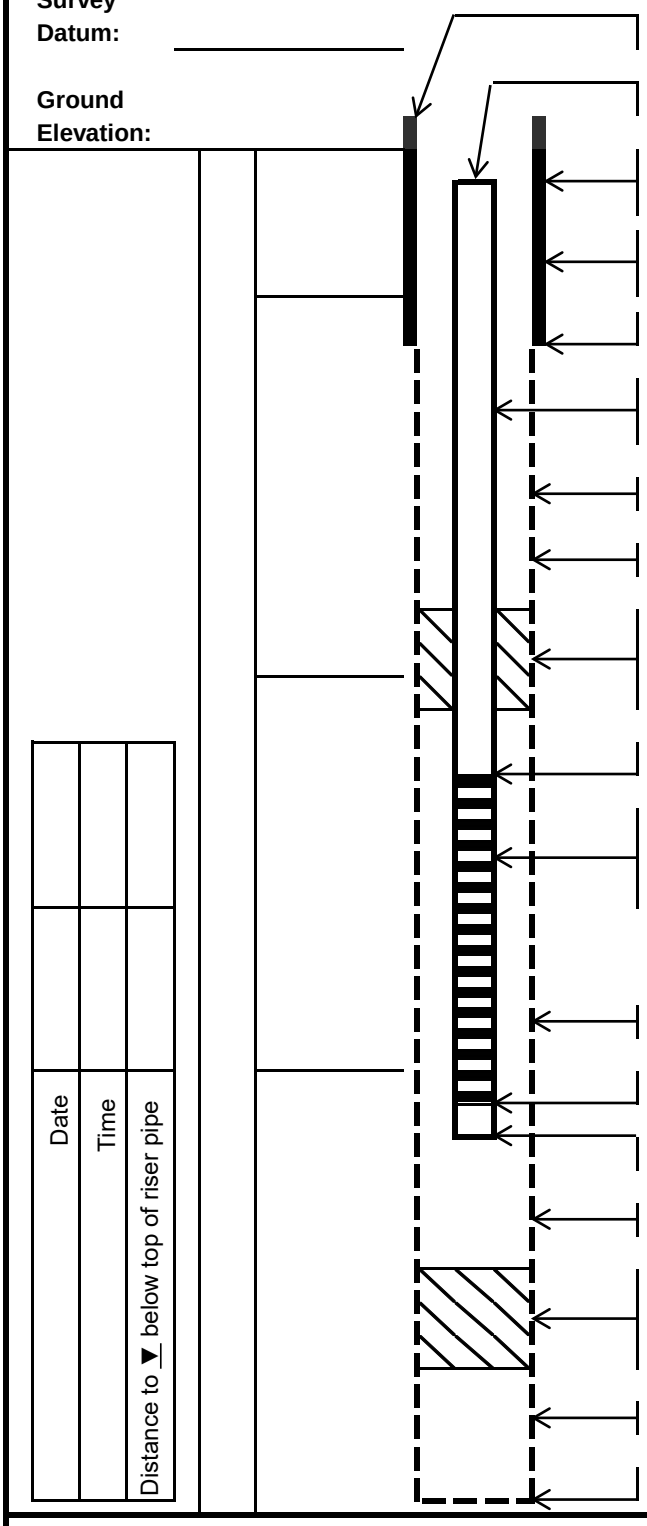
Groundwater Well Installation Log

Well ID: MW-P4

Project	30th Street Redevelopment Site	**GEI Proj. No.**	1800522
City / Town	Long Island City, NY	**Location**	Old Bridge Road
Client	Park Construction		
Contractor	AARCO		
Driller	Tom Seickel	**GEI Rep.** Bill Fitchett	**Install Date** 11/17/20

Survey Datum:

Ground Elevation:



Length of Surface Casing above Ground	Flush/NA
Dist. Top of Surf. Casing to Top of Riser Pipe	NA
Type and Thickness of Seal around Surface Casing	Concrete/6-inches
ID of Surface Casing	4" Flush Mount
Type of Surface Casing	Manhole
Depth Bottom of Surface Casing	0.5-feet
ID and OD of Riser Pipe	2-inches (OD)
Type of Riser Pipe	SCH-40 PVC
Type of Backfill around Riser Pipe	Morie #2 sand pack
Diameter of Borehole	2 1/4-inches
Depth Top of Seal	22-feet
Type of Seal	Wetted bentonite pellets
Depth Bottom of Seal	24-feet
Depth Top of Screened Section	25-feet
Type of Screen	SCH-40 PVC
Description of Screen Openings	0.020-inch slotted screen
ID and OD of Screened Section	2-inches (OD)
Type of Filter Material	Morie #2 sand pack
Depth Bottom of Screened Section	35-feet
Depth Bottom of Silt Trap	35.5-feet
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	36-feet

Notes:

GEI Consultants

APPENDIX E

Excavation Work Plan

APPENDIX E – EXCAVATION WORK PLAN (EWP)

1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination or breach or alter the site's cover system, the site owner or their representative will notify the NYSDEC contacts listed in the table below. **Table 1** includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in **Appendix B** of the Site Management Plan.

Table 1: Notifications*

Steve Walsh Assistant Engineer (Environmental) Bureau B, Section B Division of Environmental Remediation New York State Department of Environmental Conservation 625 Broadway Albany, NY 12233	(518) 402-9824 steven.walsh@dec.ny.gov
Gerard Burke Remedial Bureau B Director Division of Environmental Remediation New York State Department of Environmental Conservation 625 Broadway, 12th Floor Albany, NY 12233	(518) 402-9817 gerard.burke@dec.ny.gov
Shaun J Surani Bureau of Environmental Exposure Investigation New York State Department of Health Empire State Plaza Corning Tower, Room 1787 Albany, New York, 12237	(518) 402-1338 Shaun.Surani@health.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated, any modifications of truck routes, and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in **Appendix G** of the SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with the required request to import form and all supporting documentation including, but not limited to, chemical testing results.

2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed during all excavations into known or potentially contaminated material (remaining contamination) or a breach of the cover system. A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will perform the screening. Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Sections 6 and 7 of this EWP.

3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

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.

Stockpiles 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 the NYSDEC.

4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment

to the planned work under this SMP is posed by utilities or easements on the site. A site utility stakeout will be completed for all utilities prior to any ground intrusive activities at the site.

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

A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

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

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials. Material accumulated from the street cleaning and egress cleaning activities will be disposed off-site at a permitted landfill facility in accordance with all applicable local, State, and Federal regulations.

5 MATERIALS TRANSPORT OFF-SITE

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

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.

All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

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.

6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed off-site in a permitted facility in accordance with all local, State and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC project manager. Unregulated off-site management of materials from this site will not occur without formal NYSDEC project manager approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, (e.g. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C&D debris recovery facility) Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include, but will not be limited to: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled consistent with 6 NYCRR Parts 360, 361, 362, 363, 364 and 365. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State C&D debris recovery facility (6 NYCRR Subpart 360-15 registered or permitted facility).

7 MATERIALS REUSE ON-SITE

The qualified environmental professional as defined in 6 NYCRR part 375 will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material (i.e. contaminated) does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Proposed materials for reuse on-site must be sampled for full suite analytical parameters including per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. The sampling frequency will be in accordance with DER-10 Table 5.4(e)10 unless prior approval is obtained from the NYSDEC project manager for modification of the sampling frequency. The analytical results of soil/fill material testing must meet the site use criteria presented in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed, and the NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (January 2021) guidance values.

Approvals for modifications to the analytical parameters must be obtained from the NYSDEC project manager prior to the sampling event.

Soil/fill material for reuse on-site will be segregated and staged as described in Sections 2 and 3 of this EWP. The anticipated size and location of stockpiles will be provided in the 15-day notification to the NYSDEC project manager. Stockpile locations will be based on the location of site excavation activities and proximity to nearby site features. Material reuse on-site will comply with requirements of NYSDEC DER-10 Section 5.4(e)4. Any modifications to the requirements of DER-10 Section 5.4(e)4 must be approved by the NYSDEC project manager.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed off-site at a permitted facility in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

9 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional, as defined in 6 NYCRR Part 375, and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

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

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) and DER-10 Appendix 5 for unrestricted use. Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in 6 NYCRR Part 375 Table 375-6.8(a). Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC. Soils that meet 'general' fill requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC project manager. Soil material will be sampled for the full suite of analytical parameters, including PFAS and 1, 4-dioxane. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

10 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at

the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

11 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition. The NYSDEC project manager will be promptly notified of the discovery.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes [TAL metals, TCL volatiles and semi-volatiles (including 1,4-dioxane), TCL pesticides and PCBs, and PFAS], unless the site history and previous sampling results provide sufficient justification to limit the list of

analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC project manager for approval prior to sampling. Any tanks will be closed as per NYSDEC regulations and guidance.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone within two hours to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

12 COMMUNITY AIR MONITORING PLAN

The air monitoring program will be implemented during all intrusive remedial actions to measure the concentration of particulates in ambient air in the work zone.

The Community Air Monitoring Plan (CAMP) was developed in accordance with the NYSDOH Generic Community Air Monitoring Plan contained in Appendix 1A of the NYSDEC DER-10 and is provided as **Appendix I** of the SMP. The CAMP requires a dedicated air monitoring technician to implement real time air monitoring at the Site's downwind perimeter. The monitoring program includes VOCs, particulates, and meteorological data be recorded. Action levels for VOCs and particulates are specified in the CAMP. Meteorological data consisting of wind speed, wind direction, temperatures, barometric pressures, and relative humidity shall be collected as part of the CAMP. Implementation and management procedures are specified within the CAMP. During all phases of work, the remedial contractor will be responsible for mitigating any vapor and particulate issues, via suppression techniques defined in the CAMP.

CAMP Data must be provided to the NYSDEC and NYSDOH on a weekly basis, and any exceedances of CAMP action levels and corrective measures taken must be reported to the Departments immediately (within 24-hours).

13 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site. Specific odor control methods to be used on a routine basis will include assigning a dedicated air monitoring technician to monitor odors, backfilling excavations in a timely manner, and maintaining covers over stockpiled impacted soils. If nuisance odors are identified at the site boundary, or if odor complaints are received, 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 any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (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 odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

14 DUST CONTROL PLAN

Particulate monitoring must be conducted according to the Community Air Monitoring Plan (CAMP) provided in Section 12. If particulate levels at the site exceed the thresholds listed in the CAMP or if airborne dust is observed on the site or leaving the site,

the dust suppression techniques listed below will be employed. The remedial party will also take measures listed below to prevent dust production on the site.

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 using 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 of larger sites 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.

APPENDIX F

Quality Assurance Project Plan

GEI Consultants

Consulting
Engineers and
Scientists

37-24 & 37-28 30th Street Redevelopment Site

Quality Assurance Project Plan

37-24 & 37-28 30th Street
Long Island City, New York
NYSDEC BCP Number: C241214

Prepared for:
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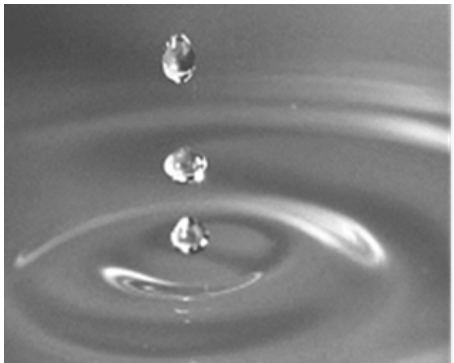
November 2021
Project 1800522



Michael Bohuski, E.I.T.
Project Engineer

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Project Manager, Sr. Environmental
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1. Introduction

This Quality Assurance Project Plan (QAPP) presents the organization, objectives, planned activities, and quality assurance/quality control (QA/QC) procedures associated with the site management activities proposed for the property located at 37-24 and 37-28 30th Street (Tax Block 371, Lots 33 and 34, referred to as "37-24 & 37-28 30th Street Redevelopment Site" or the "Site"). This plan will address the following components:

1.1 Site Management Activities

The QAPP for the site management activities discusses the QA/QC requirements for each of the project tasks. These tasks include the following:

- Groundwater monitoring;
- Soil vapor intrusion evaluation for new on-Site buildings; and
- Sub-slab depressurization system monitoring.

1.2 Material Sampling

The QAPP describes specific protocols for field testing, material handling, sample handling and storage, chain-of-custody, laboratory analysis, and data handling and management. This QAPP was prepared based on guidance provided by the United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC) including:

- *DER-10, Technical Guidance for Site Investigation and Remediation.* New York State Department of Environmental Conservation. *May 3, 2010.*
- *Analytical Service Protocol,* New York State Department of Environmental Conservation. *July 2005.*
- *US EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QA/R-5, March 2001).*
- *Guidance for Quality Assurance Project Plans (QAPP) (EPA QA/G-5, December 2002).*

The data generated from the analysis of samples will be used to determine the extent of contamination, identify impacted intervals, and determine the need for further site management activities.

2. Project Organization and Responsibility

The Site Owner and NYSDEC Brownfield Cleanup Program Volunteer is 31st Avenue Associates LLC and 37-26 30th Street LLC ("Volunteer"). The contractor responsible for redevelopment activities is Park Construction Corporation (Park). GEI Consultants, Inc., P.C. (GEI), is the environmental consultant and remedial engineer for the Volunteer. GEI will coordinate and manage, in conjunction with the Volunteer and/or their designee, the site sampling and analysis program, material testing, data reduction, QA/QC, data validation, analysis, and reporting. GEI will direct the sampling activities and coordinate laboratory and data validation activities.

The project organization and key personnel for GEI are listed below:

In-House Consultant:	Gary A. Rozmus, P.E.
Program Manager (PM):	Nicholas J. Recchia, P.G.
Project Manager:	Michael Bohuski
Proposed Field Team Leader:	William Fitchett
GEI Corporate Health & Safety Officer:	Steve Hawkins, CSP
Data Manager:	Jaimie Wargo

The primary responsibilities of each of these personnel are described in the following table.

Key Project Personnel and Responsibilities		
Position	**GEI Personnel**	**Areas of Responsibilities**
In-House Consultant	Gary A. Rozmus, P.E.	▪ Provide strategic guidance of project activities ▪ Client contact regarding strategic issues ▪ Review of project deliverables
Program Manager (PM)	Nicholas J. Recchia, P.G.	▪ Overall program oversight ▪ Project management ▪ Project schedule ▪ Client contact regarding project related issues ▪ Personnel and resource management ▪ Review of project submittals ▪ Budgeting
Project Manager	Michael Bohuski	▪ Client contact regarding project related issues ▪ Coordination of contractors ▪ Technical development and implementation of RAWP and related documents ▪ Personnel and resource management ▪ Preparation and review of project submittals ▪ Budgeting

Key Project Personnel and Responsibilities		
Position	**GEI Personnel**	**Areas of Responsibilities**
Proposed Field Team Leader	William Fitchett	▪ Client contact regarding project related issues on day to day basis as part of field operations ▪ Coordination of contractors ▪ Implementation of RAWP and Field Sampling ▪ Plan personnel and resource management ▪ Preparation of project submittals
Data Manager	Jaimie Wargo	▪ Manage raw data from the laboratory ▪ Maintain copies of COCs in the project file

Eurofins TestAmerica Edison (TestAmerica), located in Edison, New Jersey, has been selected to perform the following standard analytical chemistry parameters for groundwater samples:

- Volatile Organic Compounds (VOCs) by USEPA Method 8260C;

York Analytical Laboratories (York), located in Richmond Hill, New York, has been selected to perform the following standard analytical chemistry parameters for soil vapor and ambient air samples:

- Volatile Organic Compounds (VOCs) by USEPA Method TO-15;

Relevant certifications held by both TestAmerica and York are summarized in the following table:

Certifications		
Location	**Responsible Agency**	**Certification**
New York	New York State Department of Health (NYSDOH)	Environmental Laboratory Approval Program (ELAP) for potable water/non-potable water, solid and hazardous waste
	New York State Department of Environmental Conservation	July 2005 Analytical Service Protocol (ASP)

Table 1 provides a summary of quality assurance samples, holding times, and analysis for the media.

3. Quality Assurance Objectives

This section establishes the QA objectives for measurements that are critical to the project. The QA objectives are developed for relevant data quality indicators. These indicators include the method detection limit (MDL), reporting limit (RL), precision, accuracy, completeness, representativeness, and comparability. The data quality objectives (DQOs) are based on project requirements and ensure: (1) that the data generated during the project are of known quality and (2) that the quality is acceptable to achieve the project's technical objectives.

Quantitation Limits are laboratory-specific and reflect those values achievable by the laboratory performing the analyses. However, to ensure that the analytical methodologies are capable of achieving the DQOs, measurement performance criteria have been set for the analytical measurements in terms of accuracy, precision, and completeness. The analytical methods to be used at this site will provide a level of data quality and can be used to evaluate potential impacts to soil, soil vapor, and groundwater compared to New York State Standards, Criteria and Guidance values, and for purposes of risk assessment.

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting which will provide results that are scientifically valid, and the levels of which are sufficient to meet DQOs. Specific procedures for sampling, chain of custody, laboratory instruments calibration, laboratory analysis, reporting of data, internal quality control, and corrective action are described in other sections of the QAPP.

The data quality indicators are presented in subsections 4.1 through 4.6. Procedures to assess the data quality indicators are given below in Section 10.

The DQOs for soil samples for this project include minimum RLs specified within the 2005 NYSDEC ASP, as well as unrestricted use criteria listed in 6 New York Codes, Rules and Regulations (NYCRR) Part 375.

3.1 Required Quantification Limit

The required quantification limit is the quantitative analytical level for individual analytes needed to make decisions relative to the objectives of the project. Quantitative limits may be expressed as the MDL or some quantitative level defined in terms relative to the program. It should be noted that there is some ambiguity in the definitions and use of terms that define quantification limits. The MDL presented herein is a well-defined and accepted entity, although attainable only under ideal laboratory conditions.

Method Detection Limit: The MDL is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. MDL is determined from analysis of a sample in a given matrix type containing the analyte.

Practical Quantitation Limit: The practical quantitation limit (PQL) (also referred to as the RL) is the concentration in the sample that corresponds to the lowest concentration standard of the calibration curve.

3.2 Accuracy

Accuracy is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error.

Accuracy in the field is assessed through the adherence to all field instrument calibration procedures, sample handling, preservation, and holding time requirements, and through the collection of equipment blanks prior to the collection of samples for each type of equipment being used (e.g., sample liners, drilling shoe, or stainless–steel sampling implements).

The laboratory will assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of "standards," materials of accepted reference value. Accuracy will vary from analysis to analysis because of individual sample and matrix effects. In an individual analysis, accuracy will be measured in terms of blank results, the percent recovery (%R) of surrogate compounds in organic analyses, or %R of spiked compounds in matrix spikes (MS), matrix spike duplicates (MSD) and/or laboratory control samples (LCS). This gives an indication of expected recovery for analytes tending to behave chemically like the spiked or surrogate compounds.

3.3 Precision

Precision is the agreement among a set of replicate measurements without consideration of the "true" or accurate value: i.e., variability between measurements of the same material for the same analyte. In environmental sampling, precision is the result of field sampling and analytical factors. Precision in the laboratory is easier to measure and control than precision in the field. Replicate laboratory analyses of the same sample provide information on analytical precision; replicate field samples provide data on overall measurement precision. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision. Precision is measured in a variety of ways including statistically, such as calculating variance or standard deviation. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision.

Precision in the field is assessed through the collection and measurement of field duplicates. Field duplicates will be collected at a frequency of one per 20 investigative samples per matrix per analytical parameter, except for the waste characterization parameters. Precision will be measured through the calculation of relative percent differences (RPD) as described in subsection 13.2. The resulting information will be used to assess sampling and analytical variability.

Precision in the laboratory is assessed through the calculation of RPD for duplicate samples. For organic analyses, laboratory precision will be assessed through the analysis of MS/MSD samples and field duplicates. For the inorganic analyses, laboratory precision will be assessed through the analysis of matrix duplicate pairs and field duplicate pairs. MS/MSD samples or matrix duplicate pairs will be performed at a frequency of one per 20 primary samples per matrix.

Duplicate samples are described in subsection 5.1.2. **Table 1** summarizes the number of duplicates required during completion of the RAWP end-point sampling.

3.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. "Normal conditions" are defined as the conditions expected if the sampling plan was implemented as planned. The objective for completeness is a sufficient amount of valid data to achieve a predetermined statistical level of confidence. Critical samples must be identified, and plans must be formulated to secure requisite valid data for these samples.

Field completeness is a measure of the amount of: 1) valid measurements obtained from all the measurements taken in the project and 2) valid samples collected. The field completeness objective is greater than 90 percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all valid samples submitted to the laboratory. The laboratory completeness objective is greater than 95 percent.

To ensure that these percentages are met, materials for crucial parameters will be retained if re-sampling is required and strict adherence to holding times will be required.

3.5 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which data accurately and precisely represents either a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or

temporal boundary. To ensure representativeness, the sampling locations have been selected to provide coverage over a wide area and to highlight potential trends in the data.

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that any future work plans are followed, and that proper sampling, sample handling, and sample preservation techniques are used.

Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, and meeting sample-holding times.

3.6 Comparability

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the RAWP is followed and that proper sampling techniques are used. Maximization of comparability with previous data sets is expected because the sampling design and field protocols are consistent with those previously used.

Comparability is dependent on the use of recognized EPA or equivalent analytical methods and the reporting of data in standardized units. To facilitate data comparison, the data-reporting format as presented below will be used:

- Conventions (units reported as): for solids (weight/unit weight [i.e., milligrams per kilogram (mg/Kg)]); for liquids (weight/unit volume [i.e., micrograms per liter (µg/L)]); for air (weight/unit volume [i.e., micrograms per cubic meter ($\mu g/m^3$)]).
- Use common chemical name with corresponding chemical abstracts service (CAS) code.
- Report all data for soils on a dry-weight basis.

4. Sampling Plan

4.1 Sample Type, Location, and Frequency

Sampling for the Site will include groundwater monitoring well sampling, sub-slab soil vapor sampling, and ambient indoor and outdoor air sampling. Full details regarding each sample type are organized in the following subsections.

4.1.1 Groundwater Monitoring Well Sampling

Groundwater samples will be collected at a frequency of once per quarter and submitted to TestAmerica for laboratory analysis in accordance with the SMP. Water quality parameters including temperature, pH, turbidity, salinity, dissolved oxygen (DO), oxidation reduction potential (ORP), and specific conductance, will be monitored until stabilization prior to sample collection. Low-flow sampling methods will be used with either peristaltic pumps, bailers, whale pumps, or bladder pumps. Samples will be collected from the four monitoring wells comprising the well network described in the SMP. A summary of groundwater samples, QA/QC samples, and analysis is included in **Table 1**. Sample naming and labeling conventions will be used as described in Subsection 5.1.3 of this QAPP.

4.1.2 Soil Vapor Intrusion Evaluation Sampling

Soil vapor intrusion samples will be collected from sub-slab soil vapor, indoor air, and outdoor (ambient) air and submitted to York for laboratory analysis in accordance with the SMP. A summary of soil vapor intrusion samples, QA/QC samples, and analysis is included in **Table 2**. Samples will be collected in six-liter Summa cannisters for a duration of eight hours. Each sub-slab soil vapor sample will have a corresponding collocated indoor air sample. One outdoor air sample will be collected on the upwind side of the Site concurrently with indoor air sampling. The frequency of soil vapor intrusion sampling will be as required by NYSDEC and NYSDOH.

4.1.3 Field QC Sample Collection

Field QC samples are used to monitor the reproducibility and representativeness of field sampling activities. The field QC samples are handled, transported and analyzed in the same manner as the associated field samples. Field QC samples will include equipment blanks, trip blanks, field duplicates, and MS/MSDs. The quantity, field QC sample type and analysis is detailed in **Table 1**.

4.1.3.1 Equipment Blank Samples

Equipment Blank Samples are used to monitor the adequacy of decontamination procedures and possible sources of contamination such as potential laboratory methodologies. Equipment blanks will consist of laboratory-supplied, distilled or de-ionized water and will be used to check for potential contamination of the equipment which may cause sample contamination. Equipment blanks will be collected by routing the distilled water through a decontaminated piece of sampling equipment or disposable sampling equipment into laboratory supplied bottles. Non-dedicated field equipment will be decontaminated as specified below in subsection 6.2. Equipment blanks will be submitted to the laboratory at a frequency of one per 20 samples per matrix per type of equipment being used per parameter. Equipment blanks will not be completed for waste characterization sampling activities.

4.1.3.2 Trip Blank Samples

Trip Blank Samples will consist of analyte free water and will be prepared by the laboratory. Trip blanks are used to assess the potential for VOC contamination of samples due to contaminant migration during sample shipment and storage. Trip blanks will be transported to the project location unopened, stored with the site characterization samples, and kept closed until analyzed by the laboratory. Trip blanks will be submitted to the laboratory at a frequency of one per cooler which contains samples submitted for VOC analysis.

4.1.3.3 Field Duplicate Samples

Field Duplicate Samples, also referred to as blind duplicate samples, are two samples that are submitted from the same interval using the same sample procedures. Field duplicates will be used to assess the sampling and analytical reproducibility. Both samples are collected utilizing the same methods and are submitted for the same laboratory analysis however different sample identification numbers are used. Field duplicates will be submitted at a frequency of one per 20 samples for all matrices and all parameters. Field duplicates will not be completed for waste characterization sampling activities.

4.1.3.4 MS/MSD Samples

MS/MSD Samples are two additional aliquots of the same sample submitted for the same parameters as the original sample. However, the additional aliquots are spiked with the compounds of concern. Matrix spikes provide information about the effect of the sample matrix on the measurement methodology. MS/MSDs will be submitted at a frequency of one per 20 investigative samples per matrix for organic and inorganic parameters. MS/MSDs will not be completed for waste characterization sampling activities.

Sample Preservation and Containerization

The analytical laboratory will supply the sample containers for the chemical samples. These containers will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest EPA's Specifications and Guidance for Contaminant-Free Sample Containers. Certificates of analysis are provided with each bottle lot and maintained on file to document conformance to EPA specifications. The containers will be pre-preserved, where appropriate.

Refer to **Table 1** for a summary of QC sample preservation and container requirements.

4.2 Equipment Decontamination

All non-dedicated sampling equipment shall be cleaned between each use in the following manner:

- Wash/scrub with a biodegradable degreaser ("Simple Green") if there is oily residue on equipment surface.
- Tap water rinse.
- Wash and scrub with Alconox (or non-phosphate soap) and water mixture.
- Tap water rinse.
- Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location, where appropriate.

The drilling equipment will be decontaminated by steam cleaning or equivalent.

Decontamination fluids will be containerized into United States Department of Transportation (USDOT)/United Nations (UN)-approved 55-gallon drums or containment vessels and will be characterized and disposed of by an approved disposal facility.

5. Documentation and Chain-of-Custody

5.1 Sample Collection Documentation

5.1.1 Field Notes

Field notes documenting field activities will be maintained in a field notebook. Field logbooks will provide the means of recording the chronology of data collection activities performed during the investigation. The logbook will be a bound notebook with water-resistant pages. Logbook entries will be dated, legible, and contain accurate and inclusive documentation of the activity. No erasures or obliterations of field notes will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark, which is signed and dated by the sampler. The correction shall be written adjacent to the error.

Field logbooks will be reviewed at regular intervals by the field team leader, site manager, and project manager for completeness and representativeness. When necessary, logbooks will be supported by daily activity reports.

5.1.2 Chain-of-Custody (COC) Records

Sample custody is discussed in detail below in subsection 7.2. COC records are initiated by the samplers in the field. The field portion of the custody documentation should include:

- The project name;
- Signature(s) of sampler(s) responsible for sample custody;
- Sample ID number;
- Date and time of collection;
- Whether the sample is grab or composite;
- Names of individuals involved in sampling; and
- Air bill or other shipping number (if applicable).

On a regular basis (daily or on such a basis that all holding times will be met), samples will be transferred to the custody of the respective laboratories, via third-party commercial carriers or via laboratory courier service. Sample packaging and shipping procedures, and field COC procedures are described below in subsection 7.2.1 of this Plan. Sample receipt and log-in procedures at the laboratory are described below in subsection 7.2.2 of this Plan.

5.1.3 Sample Labeling

Each sample will be labeled with a pre-printed adhesive label using indelible ink. The label should include the date and time of collection, sampler's initials, tests to be performed, preservative (if applicable), and a unique identification. The following identification scheme will be used:

PRIMARY SAMPLES TYPES	QA/QC SAMPLE TYPES
GROUNDWATER SAMPLES Monitoring Well-ID MW-P1 **SOIL VAPOR INTRUSION SAMPLES** Indoor/Outdoor Air Sampling Location-ID IA-1 Permanent Monitoring Point-ID VMP-1	**FIELD BLANKS** SAMPLE ID [DATE] FB-03292018 **MATRIX SPIKE/DUP** SAMPLE [ID] [EITHER MS OR MSD] MW-P1 MS/MSD **TRIP BLANKS** SAMPLE-ID [DATE] TB-03292018 **BLIND DUPLICATES** SAMPLE-ID [XX] [DATE] DUP-XX-03292018

This sample label contains the authoritative information for the sample. Inconsistencies with other documents will be settled in favor of the vial or container label unless otherwise corrected in writing from the field personnel collecting samples or the Data Manager and/or the Project QA Officer.

5.2 Sample Custody

The COC provides a record of the custody of any environmental field sample from the time of collection to the delivery to the laboratory. Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files.

A sample is under a person's custody if:

- The item is in the actual possession of a person
- The item is in the view of the person after being in actual possession of the person
- The item was in the actual physical possession of the person and is locked up to prevent tampering
- The item is in a designated and identified secure area

5.2.1 Field Custody Procedures

Samples will be collected following the sampling procedures described in the RAWP. A summary of samples and collection methods are provided above in Section 5 of this QAPP. Documentation of sample collection is described above in subsection 7.1. Sample COC and packaging procedures are summarized below. These procedures will ensure that the samples will arrive at the laboratory with the COC intact.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.
- All bottles will be identified using sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample numbering system is presented above in subsection 7.1.3.
- Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions.
- Samples will be accompanied by a completed COC form. The sample numbers and locations will be listed on the COC form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, and to the laboratory facility.
- All shipments will be accompanied by the COC record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler and provided to the data manager and placed in the project files.
- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the cooler and covered with clear plastic tape after being signed by field personnel.
- If the samples are sent by common carrier, the air bill will be used. Air bills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.
- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, and signature of the laboratory sample custodian on COC document as receiving the samples and signature of sampler as relinquishing samples.

5.2.2 Laboratory Custody Procedures

After accepting custody of the shipping containers, the laboratory will document the receipt of the shipping containers by signing the COC record. The laboratory will:

- Examine the shipping containers to verify that the custody tape is intact;
- Examine all sample containers for damage;
- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the COC records;
- Compare samples received against those listed on the COC;
- Verify that sample holding times have not been exceeded;
- Examine all shipping records for accuracy and completeness;
- Determine sample pH (if applicable) and record on COC forms;
- Sign and date the COC immediately (if shipment is accepted) and attach the air bill;
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the laboratory project manager, who will be responsible for contacting the GEI data manager;
- Attach laboratory sample container labels with unique laboratory identification and test; and
- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.
- The completed COC, air bills, and any additional documentation will be placed in the project file.

6. Calibration Procedure

6.1 Field Instruments

Field instruments will be calibrated according to the manufacturer's specifications. Air monitoring instruments will be calibrated to a known reference gas standard and ambient air outside the work zone. Calibration will be completed daily. If concentrations of VOCs are encountered above the reference gas standard, the soil screening photoionization detector (PID) may be calibrated or re-checked against the reference gas standard. All calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference standard used, and the readings. The following equipment may be used during soil sampling activities.

Soil Vapor Intrusion Sampling Activities:

- RAE Systems MiniRAE 2000 (PID) with 10.6 eV lamp or equivalent.
- MSA LC Pump or SKC 224-PCXR4 (air pump for air purging monitoring) or equivalent.

Groundwater Sampling Activities:

- Horiba U22 or equivalent.

6.2 Laboratory Instruments

Calibration procedures for a specific laboratory instrument will consist of initial calibrations, initial calibration verifications, and/or continuing calibration verification. Detailed descriptions of the calibration procedures for a specific laboratory instrument are included in the laboratory's quality assurance plan, which describe the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration.

7. Sample Preparation and Analytical Procedures

Analytical samples will be collected as specified in the SMP. **Table 1** and **Table 2** provide sample collection matrices for groundwater and soil vapor intrusion, respectively.

8. Data Reduction, Validation, and Reporting

Appropriate QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in this project. Complete data packages suitable for data validation to support the generation of a Data Usability Summary Report (DUSR) according to NYSDEC requirements will be provided by the project data validator. Data Management will be performed under the direction of Jaimie Wargo, Senior Technician – Data Management.

8.1 Field Data Evaluation

Measurements and sample collection information will be transcribed directly into the field logbook or onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Reviews of the field records by the field team leader, site manager, and project manager will ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.
- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the RAWP, and that any deviations were documented and approved by the appropriate personnel.

8.2 Analytical Data Validation

Laboratory deliverables will consist of an electronic copy data package that is in general accordance with NYSDEC ASP Category B data deliverable requirements when validation is requested.

A DUSR will be prepared to evaluate the end-point samples by a party independent from the laboratory performing the analysis in accordance with Appendix 2B of DER-10.

9. Internal Quality Control

Laboratory and field quality internal control checks will be used to ensure the data quality objectives. At a minimum, this will include:

- Matrix spike and/or matrix spike duplicate samples
- Matrix duplicate analyses
- Laboratory control spike samples
- Instrument calibrations
- Instrument tunes for VOC 8260B analyses
- Method and/or instrument blanks
- Surrogate spikes for organic analyses
- Internal standard spikes for VOC 8260B analyses
- Detection limit determination and confirmation by analysis of low-level calibration standard

Field quality control samples, as identified in **Table 1**, will include:

- Equipment blanks as outlined
- Field duplicate samples as outlined
- Trip blanks as outlined
- MS/MSDs as outlined

10. Corrective Action

If unacceptable conditions are identified as a result of audits or are observed during field sampling and analysis, the PM, Field Team Leader, and QA officer will document the condition and initiate corrective procedures. The specific condition or problem will be identified, its cause will be determined, and appropriate action will be implemented.

The entire sampling program will be under the direction of the PM and QA officer. The emphasis in this program is on preventing problems by identifying potential errors, discrepancies, and gaps in the data collection, laboratory analysis, and interpretation process. Any problems identified will be promptly resolved. Likewise, follow-up corrective action is always an option in the event that preventative corrective actions are not effective.

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by other means in the Work Plan. Corrective actions are likely to be immediate in nature and most often will be implemented by the contracted laboratory analyst or the PM. The corrective action will usually involve recalculation, reanalysis, or repeating a sample run.

10.1 Immediate Corrective Action

Corrective action in the field may be needed when the sample requirements are changed (i.e., more/less samples, sampling locations other than those specified in the Work Plan), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The Field Team Leader, Site Manager, and PM will approve the corrective action and notify the QA officer. The PM and QA officer will approve the corrective measure. The Field Team Leader and Site Manager will ensure that the corrective measure is implemented by the field team.

Corrective actions will be implemented and documented in the field record book. Documentation will include:

- A description of the circumstances that initiated the corrective action
- The action taken in response
- The final resolution
- Any necessary approvals

Corrective action in the laboratory will be completed in accordance with the quality assurance procedures. Any corrective actions completed by the laboratory will be documented in both the

laboratory's corrective action files, and the narrative data report sent from the laboratory to the PM. If the corrective action does not rectify the situation, the laboratory will contact the PM, who will determine the action to be taken and inform the appropriate personnel.

If potential problems are not solved as an immediate corrective action, the contractor will apply formalized long-term corrective action if necessary.

Tables

Table 1. Groundwater Field Sampling Matrix
37-24 & 37-28 30th Street Redevelopment Site
Long Island City, New York
NYSDEC BCP Site No. C241214

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Sample ID	Number of Primary Samples	QA/QC Samples				Analytical Parameters	USEPA Method	Preservative	Holding Time	Container
		TB	FB	DUP	MS/MSD					
MW-##	4	1 per VOC Cooler	One (1) per day of sampling	One (1) per 20 samples	One (1) per 20 samples	VOCs	8260D	Cool to 4°C	14 days	(3) 40 mL VOA vials

Notes:

NYSDEC - New York State Department of Envirnmental Conservation
BCP - Brownfield Cleanup Program
QA/QC - Quality Assurance/Quality Control
TB - Trip Blank
FB - Field Blank
DUP - Duplicate
MS/MSD - Matrix Spike/Matrix Spike Duplicate
VOCs - Volatile organic compounds
SVOCs - Semivolatile organic compounds
°C- Degrees Celsius
TAL - Target Analyte List
PCBs - Polychlorniated biphenyls
NA - Not Applicable
USEPA - United States Environmental Protection Agency

Table 2. Soil Vapor Field Sampling Matrix
37-24 & 37-28 30th Street Redevelopment Site
Long Island City, New York
NYSDEC BCP Site No. C241214

Typical Sample I.D.	Sample Number					Analysis	Soil Vapor Quality Measurements
	Sample Container	Number of Duplicates	Sampling Duration	Flow Rate	Soil Vapor Probe Installation Depth	USEPA Method TO-15	Tracer Gas (Helium)
VMP-X	6 L Summa	One (1) per 20 samples	8 hours	≤0.2 L/min	2-ft.	X	X
IA-X	6 L Summa		8 hours	≤0.2 L/min	2-ft.	X	X
OA-X	6 L Summa		8 hours	≤0.2 L/min	2-ft.	X	X

APPENDIX G

Health and Safety Plan

GEI Consultants

Consulting
Engineers and
Scientists

Health and Safety Plan

37-24 & 37-28 30th Street Redevelopment Site
37-24 and 37-28 30th Street
Long Island City, NY

Prepared For:
31st Avenue Associates LLC
1836 Gilford Avenue
New Hyde Park, NY 11040

37-26 30th Street LLC
1836 Gilford Avenue
New Hyde Park, NY 11040

Submitted by:
GEI Consultants, Inc.
1000 New York Avenue, Suite B
Huntington Station, NY 11746
631-760-9300

November 2021

Project No. 1800522

Nicholas J. Recchia, P.G.
Project Manager, Sr. Environmental
Practice Leader/Hydrogeologist

Jeena Sheppard
Regional Safety Manager

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Appendices

1. Emergency Contact Information

Table 1. Emergency Contact Information

Important Phone Numbers	
Local Police:	911
Fire Department:	911
Ambulance:	911
Hospital and Occupational Clinic Information *(See Attached Maps and Directions in Appendix A)*	
Mount Sinai Queens Emergency Room: 25-10 30th Avenue Queens, NY 11102 **UMD Astoria Urgent Care:** 32-74 Steinway Street Queens, NY 11103	(718) 932-1000 (718) 721-0101
Contacts	
Project Manager: Nicholas J. Recchia	(631) 760-9300 office (516) 395-8763 cell
Safety Director: Steve Hawkins	(860) 368-5348 office (860) 916-4167 cell
Regional Health and Safety Officer: Jeena Sheppard	(856) 291-5663 office (856) 298-7138 cell
GEI People Team:	(781) 721-4117 Boston (916) 631-4596 Sacramento
Medcor Triage	1-800-775-5866
Client Contact: Robert Cerrone	(516) 352-3599 office
Other Information	
Nearest Telephone Location (or alternate means of communication)	On-site Cellular

2. Background

Project Name: 37-24 & 37-28 30th Street Redevelopment Site

Project Location: 37-24 and 37-28 30th Street, Long Island City, NY

GEI Project No: 1800522

This Health and Safety Plan (HASP) establishes policies and procedures to protect GEI Consultants, Inc. (GEI) personnel from the potential hazards posed by the activities at the 37-24 and 37-28 30th Street site in Long Island City, New York. Reading of the HASP is required of on-site GEI personnel and will be reviewed by GEI subcontractors. Subcontractors will prepare their own site-specific HASP and may use this as a guide. The plan identifies measures to minimize accidents and injuries, which may result from project activities or during adverse weather conditions. A copy of this HASP will be maintained on site for the duration of the work.

Included in Section 1 and Appendix A is a route to the nearest medical facility from the site with directions and contact information. Safety data sheets (SDS), specific to chemicals that may be encountered while working at the site, are in Appendix B. Appendix C details the signs, symptoms, care and procedures to both heat and cold stress. Appendix D includes the Tailgate Safety Briefing form, the Project Safety Briefing form, the Accident/Incident Report Form and the Near Miss Reporting Form. Appendix E contains the GEI Health and Safety (H&S) Standard Operating Procedures (SOPs) that apply to this project. Also included in Appendix E is the COVID-19 Field Work Guidance.

2.1 Site Description

The site is located in Long Island City, Queens County, New York and is identified as Block 371 and Lots 33 and 34 on the New York City Tax Map. The site is an approximately 0.368-acre area and is bounded by a two-story office building to the north, an auto repair shop and two residential houses to the south, 30th Street to the east, and Old Ridge Road to the west. The owner(s) of the site parcels at the time of issuance of the SMP is 37-26 30th Street LLC. The Site was historically used for dry cleaning and auto repair commercial businesses. The Site currently consists of the following: two seven-story residential buildings constructed in 2021.

2.2 Scope of Field Work

The scope of field work covered under this HASP includes the site management activities to be implemented in accordance with the Site Management Plan (SMP). Work conducted

under the SMP may be concurrent with other activities occurring at the Site unrelated to the site management activities. The proposed site management activities include the following:

1. Periodic collection of groundwater samples to monitor the effectiveness of the in situ chemical oxidation remedy implemented under the Remedial Action Work Plan.

2. Collection of soil vapor intrusion samples to assess and, potentially, periodically monitor for soil vapor intrusion in the two newly constructed on-Site buildings.

3. Installation, startup, operation, maintenance, and potentially decomissioning of an active sub-slab depressurization system (SSDS).

4. Implementation of a Community Air Monitoring Program (CAMP) for particulates and volatile organic compounds (VOCs), in accordance with the Excavation Work Plan (included as an appendix to the SMP), in the event that any ground intrusive work is conducted at the Site.

3. GEI Health and Safety Policy

GEI is committed to providing a safe and healthy work environment for its employees. To maintain a safe work environment, GEI has established an organizational structure and a Corporate Health and Safety Program to promote the following objectives:

- Reduce the risk of injury, illness, and loss of life to GEI employees.
- Maintain compliance with federal, state, and other applicable safety regulations; and minimize GEI employees' work exposure to potential physical, chemical, biological, and radiological hazards.

Safety policy and procedure on any one project cannot be administered, implemented, monitored, and enforced by any one individual. The total objective of a safe, accident free work environment can only be accomplished by a dedicated, concerted effort by every individual involved with the project from management down to all employees.

Each GEI employee must understand their value to the company; the costs of accidents, both monetary, physical, and emotional; the objective of the safety policy and procedures; the safety rules that apply to the safety policy and procedures; and what their individual role is in administering, implementing, monitoring, and compliance of their safety policy and procedures. This allows for a more personal approach to compliance through planning, training, understanding, and cooperative effort, rather than by strict enforcement. If for any reason an unsafe act persists, strict enforcement will be implemented.

4. Potential Hazards

The potential hazards associated with site conditions and activity hazards related to GEI on-site activities have been identified in this section.

4.1 Special Site Conditions or Concerns

- Traffic – The majority of traffic on the project site will be public traffic on 30th Street and private traffic on Old Ridge Road.
- Hazardous winter conditions – Cold stress, slippery surfaces, and icy conditions are possible dangers.

Safety equipment will include: First aid kit, fire extinguisher, eye wash bottles, adequate supply of drinking water and electrolyte fluids, hand cleaner, insect repellent, sunscreen, and cell phone. GEI employees will wear Level D PPE and face coverings as required.

4.2 Activity Hazard Analysis

The potential hazards for this project associated with site conditions and activity hazards associated with GEI on-site activities have been identified in Table 2. General hazards and control measures that are applicable to all site activities are identified in the General Hazards section. The site-specific tasks, potential hazards, and control measures established to reduce the risk of injury or illness are identified in the Activity Hazard section of Table 2. Health and Safety SOPs for routine hazards and common site conditions are referenced in the table below and included in Appendix E.

Table 2. Activity Hazard Analysis

General Hazards These Hazards Apply to All Site Activities	Control Measure
Chemical / Contaminant Exposure – Skin and eye injury/irritation	• Wear protective coveralls (e.g. Tyvek ®) with shoe covers, safety glasses, face shield, Nitrile gloves. • Dispose of gloves after use and wash hands. • Avoid contact with pooled liquids and limit contact with contaminated soils/groundwater. • See SOP HS-009

General Hazards These Hazards Apply to All Site Activities	Control Measure
Cold Stress – Hypothermia, Frostbite	• Take breaks in heated shelters when working in extremely cold temperatures. • Drink warm liquids to reduce the susceptibility to cold stress. • Wear protective clothing (recommended three layers: an outside layer to break the wind, a middle layer to provide insulation, and an inner layer of cotton of synthetic weave to allow ventilation). • Wear a hat and insulated boots. • Keep a change of dry clothing available in case clothes become wet. • Do heavy work during the warmer parts of the day and take breaks from the cold. • If possible shield work areas from drafts of wind and use insulating material on equipment handles when temperatures are below 30°F • Watch for symptoms of cold stress. (see Appendix C in HASP)
Driving	• Employees must wear their safety belt while in a moving vehicle. • Vehicle accidents will be reported in accordance with GEI's accident reporting procedures. • Vehicles will be properly maintained and safely operated (refer to GEI's Fleet Maintenance Program). • Employees will follow safe driving behaviors, which include limiting distractions such as manipulating radios or other equipment that may cause a distraction. Employees should not exceed the posted speed limit and should maintain a safe distance between other vehicles. • Use defensive driving techniques. • Driving distance and time after a 12-hour shift should not exceed 30 miles or 30 minutes (whichever is greater). • See SOP HS-004
Dusty Conditions – Eye and respiratory irritation	• Avoid travel at extreme times • Wear protective gear – dust masks, safety glasses

General Hazards These Hazards Apply to All Site Activities	Control Measure
Heat stress – Fainting, Fatigue, Heat Stroke	• Increase water intake while working. • Increase number of rest breaks and/or rotate workers in shorter work shifts. Rest in cool, dry areas. • Watch for signs and symptoms of heat exhaustion and fatigue. • Plan work for early morning or evening during hot months. • Use ice vests when necessary. • In the event of heat stroke, bring the victim to a cool environment and initiate first aid procedures. • See Appendix C of the HASP
Inclement Weather	• Listen to local forecasts for warnings about specific weather hazards such as tornados, thunder storms, and flash floods. • If the storms produce thunder and/or lightning, leave the work area immediately and move to a safe area. • Discuss an action plan prior to the severe weather. • Wear appropriate PPE for the type of weather that could be encountered. • Stop work until conditions are suitable. Take cover in vehicles or shelter as appropriate. • See SOP HS-010
Insects – Bites, Stings, Allergic Reactions	• Apply insect repellent prior to performing field work and as often as needed throughout the work shift • Wear proper protective clothing (work boots, socks and light colored clothing) • Wear shoes, long pants with bottoms tucked into boots or socks, and a long-sleeved shirt when outdoors for long periods of time, or when many insects are most active (between dawn and dusk). • When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible • Field personnel who may have insect allergies should have bee sting allergy medication on site and should provide this information to the SSO and the CHSO prior to commencing work. • Field personnel should perform a self-check at the end of the day for ticks. • See SOP HS-001

General Hazards These Hazards Apply to All Site Activities	Control Measure
Physical Injury – Slips, Trips and Falls	• Wear PPE that properly fits, is in good condition and appropriate for the activities and hazards. • Maintain good visibility of the work area. • Avoid walking on uneven, steeply sloped or debris ridden ground surfaces. • Plan tasks prior to preforming them including an activity hazard analysis. • Keep trafficked areas free from slip/trip/fall hazards. • Maintain weed growth in sampling areas, especially on slopes. • Wear shoes with traction. • Avoid traversing steep areas in slippery conditions. • Do not carry heavy objects to sampling areas, on steeply sloped areas, or where steep areas must be traversed to arrive at sample points.
Repetitive Motion Injury - Standing, Squatting, and Bending Over	• Take regular breaks and do not work in unusual positions for long periods of time. • Walk and stretch between tasks. • See SOP HS-025
Vehicular Traffic – Struck by injury, crushing	• Increase visibility of the work area to others by using cones, flags, barricades, proper lighting and caution tape to define work area. • Use a "spotter" to locate oncoming vehicles. • Use vehicle to block work area. • Engage police detail for all work conducted in appropriate areas. • Wear high-visibility, reflective vest at all times. • Maintain minimum DOT defined distances to other traffic lanes. • See SOP HS-016.

Activity	Potential Hazard	Control Measures
Carrying Equipment	Heavy lifting, strains/sprains, slips/trips/falls, pinch points	• Use proper lifting techniques as defined in the heavy lifting activity analysis below • Wear the proper type of glove to protect hands against sharp edges and skin/soft tissue injuries • Wear appropriate footwear • Be aware of hard to grip and hold items that may force your hand or wrist into awkward, stressful positions and cause disorders like tendinitis or carpal tunnel syndrome • Take breaks when carrying items frequently and/or for long distances • Do not over reach when picking up or placing items. • Use the buddy system when necessary • When climbing ladders, maintain three points of contact at all times. DO NOT carry equipment up or down ladders unless it is in a secure backpack or similar hands-free shoulder-strap bag or case. Lower or raise larger equipment by crane or rope
Excavation and Trenching Oversight	Crushing, entrapment, falls, fire/explosion	• Prior to excavating, determine utility locations and have locations marked by utility companies and the property owner. • Utilities shall be properly supported and barriers should be erected around excavations in remote areas. • Backfill temporary excavations when work is completed. • Personnel must remain 2 feet from the face of the excavation. • Sides, slopes, and faces shall meet OSHA requirements. • Excavation entry will be allowed only with proper sloping or shoring. • See SOP HS-006
Groundwater Sampling	Contaminant Exposure, Heavy Lifting, Repetition, Slips/Trips/Falls	• Wear hardhat; high visibility reflective safety vest; steel-toed, steel-shank boots or composite toe and shank; safety glasses and Nitrile/neoprene gloves. • Dispose of gloves after use and wash hands. • User proper lifting techniques. • Take regular breaks and do not work in unusual positions for long periods of time. • Keep trafficked areas free from slip/trip/fall hazards.
Heavy Lifting	Back injury, knee injury	• Use proper lifting techniques. • Ask fellow worker for help. • Use a mechanical lifting device or a lifting aid where appropriate. • If you must lift, plan the lift before doing it. • Check your route for clearance. • Bend at the knees and use leg muscles when lifting. • Use the buddy system when lifting heavy or awkward objects. • Do not twist your body while lifting. • See SOP HS-025

Activity	Potential Hazard	Control Measures
Hammer Drill Use	Cuts/Scrapes, Noise, Slips/Trips/Falls, Heavy Lifting, Repetition, Struck-by, caught-in-between equipment, pinch points, hot surfaces (burns), electrical shock	• Wear appropriate PPE including: hard hat, gloves, steel toed/shank safety boots, safety glasses, high visibility reflective clothing, and ear plugs. • Use all available work practices to control dust exposures, if they cannot be controlled respiratory protection must be used. • Keep hands and loose clothing away from moving parts • Use proper lifting techniques. • Do not remove equipment guards on equipment. • Take regular breaks and do not work in unusual positions for long periods of time. • Avoid standing in water when working with electrically powered equipment or tools. • Inspect electrically powered equipment or tools prior to use. Tag and remove from service any tool with frayed cords, broken plugs, or otherwise damaged. • Electrical equipment of tools must be connected to ground fault circuit interrupters.
Soil Sampling/Soil Vapor Sampling	Contaminant Exposure, Cuts/Scrapes, Heavy Lifting, Repetition, Slips/Trips/Falls	• Wear hardhat; high visibility reflective safety vest; steel-toed, steel-shank boots or composite toe and shank; safety glasses; Nitrile/neoprene gloves; and earplugs as necessary. • Dispose of gloves after use and wash hands. • Wear work gloves over nitrile gloves. • Excavation entry will be allowed only with proper sloping or shoring. • Take regular breaks and do not work in unusual positions for long periods of time. • Keep trafficked areas free from slip/trip/fall hazards.

Activity	Potential Hazard	Control Measures
System Set Up and Tear Down	Site Obstructions, Slips/Trips/Falls, Fire and Explosion, Heavy lifting, Pinch Points, Cuts or Abrasions	• Wear appropriate PPE including: hard hat, gloves, steel toed/shank safety boots, safety glasses, high visibility reflective clothing. • Stay Alert! Position yourself in a safe location during set up and tear down. • Identify all site obstructions (such as poles, soft ground, protruding objects, manholes, and well risers) and overhead obstructions (such as power lines and trees) prior to moving system into place. • Use spotter to provide assistance if available. • Use proper lifting techniques. • Keep trafficked areas free from slip/trip/fall hazards. • Use extreme caution when climbing on and around the system. Slipping inside the system operations area can cause significant bodily injury due to contact with metal parts or due to twisting, or turning body parts. • When working on surfaces 6 feet or more above ground a guardrail system will be used where installed. Where guardrail systems are not installed, personal fall arrest system must be used. • A Fall Protection Matrix is also required when using fall protection equipment. • Propane tanks are potential sources for fire and explosion. Never fill propane tanks within 25 feet of an open ignition source. • A fully charged, 20 lb. fire extinguisher must be available for immediate use on site at all times.

Personal Protective Equipment (PPE) is the initial level of protection based on the activity hazards and site conditions which have been identified. Upgrades to respiratory protection may be required based on the designated Action Levels found in Section 9. If site conditions suggest the existence of a situation more hazardous than anticipated, the site personnel will evacuate the immediate area. The hazard, the level of precautions, and the PPE will then be reevaluated with the assistance and approval of the Safety Director and the Project Manager (PM).

4.3 Personal Safety

Field activities have the potential to take employees into areas which may pose a risk to personal safety. The following websites (sources) have been researched to identify potential crime activity in the area of the project:

- https://www1.nyc.gov/site/nypd/stats/crime-statistics/citywide-crime-stats.page: Crimes in NYPD 114th Precinct have increased in recent years (e.g. Year to Date Long Island City is 436 total crimes, which is a 14.44 percent increase over the previous year and a 7.39 percent change over two years).

To protect yourself, take the following precautions:

- If deemed necessary by the PM, use the buddy system (teams of a minimum of two persons present);
- Let the Site Safety Manager (SSM) know when you begin work in these areas and when you leave;
- Call in regularly;
- Pay attention to what is going on around you; and
- If you arrive in an area and it does not look safe to get out of your vehicle, lock the doors and drive off quickly but safely.

Employees must not knowingly enter into a situation where there is the potential for physical and violent behaviors to occur. If employees encounter hostile individuals or a confrontation develops in the work area, suspend work activities, immediately leave the area of concern, and contact local 911 for assistance. Notify the SSM and Safety Team (Safety Director and Regional Safety Managers – SafetyTeam@geiconsultants.com) of any incidents once you are out of potential danger.

In the event of an emergency, prompt communications with local emergency responders is essential. At least one charged and otherwise functioning cell phone to facilitate emergency communications will be on-site. Confirmation of cellular phone operation will be confirmed at the start of each working day.

4.3.1 Coronavirus (COVID-19)

GEI field employees will follow the COVID-19 Field Guidance in Appendix E.

Distancing

COVID-19 spreads from person-to-person primarily through droplets that are emitted from the initial person to a distance of 6 feet.

- Maintain a distance of at least 6 feet (2 meters) from others. This includes during site meetings and breaks and while performing work tasks. Meetings should be held outside or by phone/video.
- Minimize the number of employees in one location to the extent possible. Follow local restrictions for maximum number of people congregated in one location at a time.
- If tasks need to be performed close to others (within 6 feet) and that cannot be avoided, wear appropriate PPE including a face mask (surgical or cloth), gloves, and eye protection.

NOTE: Face masks are not a substitute for distancing. Masks are meant to protect others in case you are infected. Contact the Safety Team (safetyteam@geiconsultants.com) to discuss any special circumstances and the PPE warranted.

- Wear nitrile gloves as much as practicable and change them frequently. As practicable, wash your hands or use sanitizer between glove changes. Wash your hands after wearing gloves.
- Minimize and stagger time in office spaces to performing essential duties such as picking up and dropping off equipment and samples. If you need to spend more time in a project office (e.g., a construction trailer), it's important that the workspace allows for proper social distancing.
- When traveling to project sites, travel in separate vehicles. Do not travel in the same vehicle.

Hygiene Practices

The hygiene practices we have been instructed to perform more routinely apply to performing field work as well, such as:

- Frequent hand washing with soap and warm water for 20 seconds. If soap and water are not readily available, use hand sanitizer (containing 60% alcohol) until soap and water can be used. If sanitizer is not available, bringing gallon containers of water and soap may be a good substitute.
- If you are filling water bottles (for drinking or hand washing) keep the bottle away from the spigot to avoid transfer of germs or contaminants.
- Wipe down surfaces with disinfectant on a routine basis (at least once per day). This includes field equipment and other items that may have previously been used by others. This is especially important while working in construction trailers. When using company and personal vehicles, wipe surfaces including the steering wheel, gear shifter, controls, and door handles before and after use.
- Wear nitrile gloves as frequently as possible. Hand washing is necessary after removing gloves.
- When greeting others avoid handshaking, hugging, or other personal contact. A greeting from a distance such as a wave is suggested.
- Avoid sharing field equipment and other materials with others. Before using field equipment or putting it away, wipe it down with disinfectant or wash it with soap and water. Note, use extra caution using disinfectants while collecting environmental samples to ensure that the samples are not compromised.

4.3.2 Excavations and Trenches

The safety requirements for excavations and trenches must be determined by a competent person who is capable of identifying existing and predictable hazards and work conditions that are unsanitary, hazardous, or dangerous to GEI employees. The competent person must also have the authorization to take prompt corrective measures to eliminate unsatisfactory conditions. GEI employees will not enter trenches.

The following are general requirements for work activities in and around excavations:

- Prior to initiation of excavation activity (or ground intrusive activity, such as drilling), the location of underground installations will be determined. The <One-Call/Dig-Safe> center will be contacted by the Contractor/Subcontractor a minimum of 72 hours prior to excavation activities. It may also be necessary to temporarily support underground utilities during excavation. When excavations approach the estimated location of underground installations, the exact location of the underground installations will be determined by means that are safe for GEI employees, i.e., hand dig, test pits, etc.
- Excavations should be inspected daily by the excavating company's competent person prior to commencement of work activities. Evidence of cave-ins, slides, sloughing, or surface cracks or excavations will be cause for work to cease until necessary precautions are taken to safeguard employees.
- Excavated and other materials or equipment that could fall or roll into the excavation, and vehicular traffic and heavy equipment will be placed at least 5 feet from the edge of the excavation.
- Excavation operations will cease immediately during hazardous weather conditions such as high winds, heavy rain, lightning, and heavy snow.

Employees will refer to GEI's Excavation Safety SOP for further information.

4.3.3 Heat Stress

Employees may be exposed to the hazards associated with heat stress when ambient temperatures exceed 70ºF. Employees should increase water intake while working in conditions of high heat. Enough water should be available so that each employee can consume 1 quart of water per hour. In addition, they should increase number of rest breaks and/or rotate employees in shorter work shifts. Employees should rest in cool, dry, shaded areas for at least 5 minutes. Employees should not wait until they feel sick to cool down. Watch for signs and symptoms of heat exhaustion and fatigue. In the event of heat stroke, bring the victim to a cool environment, call for help, and initiate first aid procedures

The procedures to be followed regarding avoiding heat stress are provided in Appendix C – Heat Stress Guidelines and in GEI's Heat Stress program.

4.3.4 Cold Stress

Employees may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery surfaces, brittle equipment, and poor judgment. The procedures to be followed regarding avoiding cold stress are provided in Appendix C – Cold Stress Guidelines and in GEI's Cold Stress program.

4.3.5 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, and generators. Employees who will perform suspected or established high noise tasks and operations will wear hearing protection. If deemed necessary by the SSM, the Safety Director will be consulted on the need for additional hearing protection and the need to monitor sound levels for site activities. Other employees who do not need to be in proximity of the noise should distance themselves from the equipment generating the noise.

4.3.6 Hand and Power Tools

In order to complete the various tasks for the project, personnel may use hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel when using hand and power tools and Ground Fault Circuit Interrupter (GFCI)-equipped circuits will be used for power tools.

4.3.7 Slips, Trips, and Falls

Working in and around the site may pose slip, trip, and fall hazards due to slippery and uneven surfaces. Excavation at the site may cause uneven footing in trenches and around the soil piles. Steep slope and uneven terrain conditions at the site are also a primary concern. GEI employees will wear proper foot gear and will employ good work practice and housekeeping procedures to minimize the potential for slips, trips, and falls.

4.3.8 Manual Lifting

Manual lifting of objects and equipment may be required. Failure to follow proper lifting technique can result in back injuries and strains. Employees should use a buddy system and/or power equipment to lift heavy loads whenever possible and should evaluate loads before trying to lift them (i.e., they should be able to easily tip the load and then return it to

its original position). Carrying heavy loads with a buddy and proper lifting techniques include: 1) make sure footing is solid; 2) make back straight with no curving or slouching; 3) center body over feet; 4) grasp the object firmly and as close to your body as possible; 5) lift with legs; and 6) turn with your feet, don't twist.

4.4 Chemical Hazards

The characteristics of compounds at the site are discussed below for information purposes. Adherence to the safety and health guidelines in this HASP should reduce the potential for exposure to the compounds discussed below.

Chlorinated Hydrocarbons

Chlorinated hydrocarbons (organochlorides) are a very large and diverse group of hydrocarbon molecules that also have at least one covalently bound chlorine atom chemically bonded to them. Chlorinated hydrocarbons are used predominantly as solvents and have historically been used as industrial degreasers, dry cleaning solvents, anesthetic agents and as refrigerants. They are colorless, volatile liquids with a moderately sweet aroma and partially soluble in but denser than water. They are the most common DNAPL.

The more common forms of chlorinated solvent contamination of soils and ground waters include:

- Tetrachloroethene (PCE, Tetrachloroethylene)
- Carbon tetrachloride (Tetrachloromethane or carbon tet)
- Trichloroethylene (TCE,Trichloroethene)
- 1,1,1-TrichloroMethane (Chloroform)
- 1,1,1 - Trichloroethane (TCA, methyl chloroform, chlorothene, Solvent 111)
- Dichloromethane (DCM or methylene chloride)

As a class, the chlorinated hydrocarbons are potent central nervous system depressants or stimulants. They also cause greater liver and kidney damage compared to other organic solvents. Many have been shown to cause cancer in laboratory animals; due to widespread industrial use, the issue of carcinogenic risk to humans is one of the most controversial issues in regulatory toxicology.

Exposure to chlorinated hydrocarbon compounds in the occupational setting is primarily through inhalation. Skin absorption is variable and usually insignificant, although dermal absorption following prolonged or extensive skin contact can cause systemic toxicity.

Heavy Metals

Exposure to high concentrations of arsenic can cause dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, and hyper pigmentation of skin. Chronic exposure to arsenic has resulted in lung cancer in humans.

Exposure to high concentrations of aluminum can cause irritation of the eyes, skin, and the respiratory system.

Exposure to high concentrations of antimony can cause irritation of eyes, skin, nose, throat, and mouth; coughing; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; and could be unable to smell properly. Chronic exposure to antimony can produce respiratory effects that include antimony pneumoconiosis (inflammation of the lungs due to irritation caused by the inhalation of dust), alterations in pulmonary function, chronic bronchitis, chronic emphysema, inactive tuberculosis, pleural adhesions, irritation; cardiovascular effects (increased blood pressure, altered EKG readings and heart muscle damage) and gastrointestinal disorders in humans.

Exposure to high concentrations of beryllium can result in “beryllium sensitization”, which is an allergic response to beryllium. Symptoms of the disease include cough, shortness of breath, fatigue, fevers, skin rash, and night sweats. In the later stages, lung tissue becomes scarred. In severe cases, the right side of the heart may be strained due to increased pressure in the pulmonary artery from lung damage.

Exposure to high concentrations of cadmium can cause acute symptoms such as pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness and pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; loss of the sense of smell), mild anemia; and is considered a potential occupational carcinogen.

Exposure to chromium can cause acute symptoms such as irritation of the eyes, nose and throat as well as wheezing and coughing. Chronic effects include nosebleeds, nasal congestion, dermatitis, and loss of sight.

Exposure to high concentrations of copper through inhalation can cause irritation of the eyes, nose, pharynx, nasal septum. Ingestion may cause a metallic taste. Skin irritation may result from direct contact with skin. Damage to the liver and kidneys may occur.

No adverse health effects are associated with environmental exposure to iron. Target organs for iron via ingestion of iron (most often in supplement form) are the liver, cardiovascular system, and kidneys. Exposure to high concentrations of iron through ingestion can cause salivation nausea, vomiting, diarrhea, and abdominal pain.

Exposure to lead may cause acute symptoms such as eye irritation, weakness, weight loss, abdominal pain, and anemia. Chronic exposure to lead may result in kidney disease, effects to the reproductive system, blood forming organs, and CNS.

Lead and arsenic are regulated by specific OSHA standards. They are 29 CFR 1910.1025/1926.52 and 29 CFR 1910.1018/1926.1118, respectively. These standards include specific requirements for air monitoring, signs and labels, training and medical surveillance.

Exposure to high concentrations of manganese can cause manganism, metal fume fever, flu-like fever, and kidney damage.

Exposure to high concentrations of nickel may cause sensitization dermatitis, allergic asthma, and pneumonitis. Exposure to mercury can cause dizziness, salivation nausea, vomiting, diarrhea, constipation, emotional disturbance, and kidney injury. Chronic exposure to mercury can cause CNS damage.

Exposure to high concentrations of selenium can cause mucous membrane irritation, coughing, sneezing, shortness of breath, chills, headaches, hypotension, and CNS depression. Chronic exposure to selenium could cause bronchial irritation, gastrointestinal distress, excessive fatigue, and skin discoloration.

Exposure to high concentrations of thallium can cause nausea, diarrhea, abdominal pain, vomiting; tremor; chest pain, pulmonary edema; convulsions, psychosis; liver, kidney damage; and alopecia.

Vanadium may cause greenish-black discoloration of the tongue, and is possibly carcinogenic to humans. Long-term or repeated exposure to vanadium may have effects on the respiratory tract, resulting in chronic rhinitis and chronic bronchitis.

Exposure to high concentrations of zinc through ingestion can cause abdominal pain, nausea, vomiting, and diarrhea. Chronic exposure can lead to low blood pressure, jaundice, and seizures.

These metals are at environmental concentrations and are not expected to be at concentrations that exposure symptoms would occur. As with SVOCs, the primary route of exposure is through inhalation of dust particles when soil is disturbed and becomes airborne.

4.4.1 Evaluation of Organic Vapor Exposure

Air monitoring reduces the risk of overexposure by indicating when action levels have been exceeded and when PPE must be upgraded or changed. Action Levels for VOCs and associated contingency plans for the work zone are discussed within Section 9 of this HASP.

Exposure to organic vapors will be evaluated and/or controlled by:

- Monitoring air concentrations for organic vapors in the breathing zone with a photoionization detector (PID) or a flame ionization detector (FID).
- When possible, engineering control measures will be utilized to suppress the volatile organic vapors. Engineering methods can include utilizing a fan to promote air circulation, utilizing volatile suppressant foam, providing artificial ground cover, or covering up the impacted material with a tarp to mitigate volatile odors.
- When volatile suppression engineering controls are not effective and organic vapor meters indicate concentrations above the action levels, then appropriate respiratory protection (i.e., air purifying respirator with organic vapor cartridge) will be employed.

4.4.2 Evaluation of Skin Contact and Absorption

Skin contact by contaminants may be controlled by use of proper hygiene practices, PPE, and good housekeeping procedures. The proper PPE (e.g., Tyvek, gloves, safety glasses) as described in Section 5 will be worn for activities where contact with potential contaminated media or materials are expected.

SDSs for decontamination chemicals and laboratory reagents that may be used on site are included in Appendix B. Specific chemical hazards information from the occupational health sources are summarized in Table 3.

Table 3. Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Aluminum	7429-90-5	NIOSH REL: TWA 10 mg/m3 (total) TWA 5 mg/m3 (resp)	TWA 15 mg/m3 (total) TWA 5 mg/m3 (resp)	Inhalation, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Silvery-white, malleable, ductile, odorless metal. FP: none LEL:N/A UEL: N/A VP: 0 mm
Antimony	7440-36-0	TWA 0.5 mg/m3	TWA 0.5 mg/m3	Inhalation Ingestion Skin Contact Eyes	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Respiratory system, skin, eyes, cardiovascular systems	Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder. FP: NA IP: NA LEL: NA UEL NA VP: 0 mm
Arsenic	7440-38-2	0.01 mg/m^3	0.01 mg/m^3 A.L. .005mg/m3	Inhalation Skin Absorption Ingestion Skin Contact	Ulceration of nasal septum, dermatitis, GI disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, potential carcinogen	Liver, kidneys, skin, lungs, lymphatic system	Metal: Silver-gray or tin-white, brittle, odorless solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Barium	7727-43-7	TWA 10 mg/m3 (total) TWA 5 mg/m3 (resp)	TWA 15 mg/m3 (total) TWA 5 mg/m3 (resp)	Inhalation, skin and/or eye contact	Irritation eyes, nose, upper respiratory system; benign pneumoconiosis (baritosis)	Eyes, respiratory system	Metal: White or yellowish, odorless powder FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm

Table 3. Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Beryllium	7440-41-7	NIOSH REL: Ca C 0.0005 mg/m3	TWA 0.002 mg/m3 C 0.005 mg/m3 (30 minutes), with a maximum peak of 0.025 mg/m3	Inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	A hard, brittle, gray-white solid.. FP: none LEL:N/A UEL: N/A VP: 0 mm
Cadmium	7440-43-9 (metal)	CA	TWA 0.005 mg/m^3	Inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Respiratory system, kidneys, prostate, blood; **Cancer Site** [prostatic & lung cancer]	Silver-white, blue-tinged lustrous, odorless solid. FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Chromium (Chromic Acid and Chromates)	1333-82-0	0.05 mg/m^3	0.1 mg/m^3	Inhalation Ingestion Skin Contact	Irritates respiratory system, nasal, septum perforation, liver and kidney damage, leucocytosis (increased blood leucocytes), leukopenis (reduced blood leucocytes), moncytosis (increased monocytes), Eosinophilia, eye injury, conjunctivitis, skin ulcer, sensitivity dermatitis, potential carcinongen	Blood, respiratory system, liver, kidney, eyes, skin, lung cancer	FP:NA IP:NA VP: Very Low LEL: NA UEL: NA

Table 3. Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Iron	1309-37-1	Iron oxide dust and fume (Fe2O3) as Fe: 5 mg/m3 (TWA);	Iron oxide dust and fume: 10 mg/m3	Inhalation, ingestion, eye contact	Respiratory tract irritation, coughing, shortness of breath, overdose of iron may cause vomiting, abdominal pain, bloody diarrhea, vomiting blood, lethargy, and shock; acidity in the blood, bluish skin discoloration, fever, liver damage, and possibly death; eye and cornea irritation and discoloration	Eyes, respiratory system, GI tract, liver	Reddish brown solid FP: NA LEL: NA UEL: NA VP: 0 mmHg
Manganese	7439-96-5	TWA 1 mg/m3 ST 3 mg/m3	C 5 mg/m3	Inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	Respiratory system, central nervous system, blood, kidneys	A lustrous, brittle, silvery solid. FP: NA LEL: NA UEL: Na VP: 0 mmHg
Mercury	7439-97-6	0.025 mg/m^3	0.10 mg/m3	Inhalation Ingestion Skin Contact Skin Absorption	Irritates eyes and skin, chest pain, cough, difficulty breathing, bronchitis, pneumonitis, tremor, insomnia, irritability, indecision, headache, fatigue, weakness, stomatitis, salivation, Gastrointestinal disturbance, weight loss, proteinuria	Eyes, skin, respiratory tract, central nervous system	Silver-white, heavy odorless liquid FP: NA IP:? LEL: NA UEL:NA VP: 0.0012 mm
PCE	127-18-4	25 ppm	100 ppm TWA 200 ppm C 300 ppm (5 minutes in any 3 hours)	Inhalation, Ingestion, Skin Contact	Irritation, nausea, vomiting, chest pain, difficulty breathing, headache, drowsiness, dizziness, disorientation, loss of coordination, blurred vision, loss of appetite, stomach pain, pain in extremities	Eyes, skin, respiratory system, liver, CNS	A colorless, sweet smelling volatile liquid. FP: NA IP: 9.32 eV LEL: NA UEL: NA VP: 14 mmHg

Table 3. Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
TCE	79-01-6	200 ppm	100 ppm TWA 200 ppm C 300 ppm (5 minutes in any 3 hours)	Inhalation, Ingestion, Skin Contact	Irritation to eyes, skin, dizziness, fatigue, blurred vision, tremors, nausea, vomiting, drowsiness, headache	Kidneys, CNS, liver, heart, upper respiratory	Colorless liquid with chloroform odor FP: NA IP: 9.45 eV LEL: 8% UEL: 10.5% VP: 58 mmHg
VOCs1	NA	0.5 ppm (Skin)	0.5 ppm TWA 2.5 ppm STEL	Inhalation, Skin Absorption, Ingestion, Skin Contact	Irritate eyes and skin; headaches; dizziness; nausea; kidney; liver damage; depress CNS	Skin, eyes, liver, kidney, CNS	Colorless volatile liquid, sometimes with a sweet or solvent odor
Zinc	1314-13-2	5 mg/m3 (TWA), 10 mg/m3 (STEL) for zinc oxide fume	10 mg/m3 (TWA), for zinc oxide fume	Inhalation	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Respiratory system	Colorless liquid FP: NA? IP: 11 eV LEL: 7.5% UEL: 12.5% VP: 100 mmHg

Abbreviations:

°F = degrees Fahrenheit
ACGIH = American Conference of Industrial Hygienists
A.L. = Action Level
atm = atmosphere
C = ceiling limit, not to be exceeded
CAS # = chemical abstract services number
CNS = Central Nervous System
CTPV = Coal Tar Pitch Volatiles
CVS = Cardiovascular System
eV = electron volt
f/cc = fibers per cubic centimeter
IP = Ionization Potential
LEL = Lower explosive limit
mg/m^3 = micrograms per cubic meter
min = minute
mm = millimeter
mmHg = millimeters of mercury
N/A = not applicable
OSHA = Occupational Safety and Health Administration
PAH = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Biphenyls
PEL = Permissible exposure limit

Table 3. Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data

FP = Flash point
GI = Gastro-intestinal
H2S = Hydrogen Sulfide
HCN = Hydrogen Cyanide
hr. = hour
ppm = parts per million
Skin = significant route of exposure
STEL = Short-term exposure limit (15 minutes)
TWA = Time-weighted average (8 hours)
VP = vapor pressure approximately 68°F in mm Hg

4.5 Biological Hazards

Areas of the site may be wooded, surrounded with brush, or landscaped. Therefore, employees working on this project should be aware of the potential biological hazards at this site. Each is discussed in detail below:

4.5.1 Ticks

Lyme Disease

Ticks are bloodsuckers, attaching themselves to warm-blooded vertebrates to feed. Deer ticks are associated with the transmission the bacteria that causes Lyme disease. Female deer ticks are about ¼-inch in length and are black and brick red in color. Males are smaller and all black. If a tick is not removed, or if the tick is allowed to remain for days feeding on human blood, a condition known as tick paralysis can develop. This is due to a neurotoxin, which the tick apparently injects while engorging. This neurotoxin acts upon the spinal cord causing incoordination, weakness, and paralysis.

The early stages of Lyme disease, which can develop within a week to a few weeks of the tick bite, are usually marked by one or more of these signs and symptoms:

- Tiredness
- Chills and fever
- Headache
- Muscle and/or join pain
- Swollen lymph glands
- Characteristic skin rash (i.e. bullseye rash)

Prevention

Tick season lasts from April through October; peak season is May through July. You can reduce your risk by taking these precautions:

- During outside activities, wear long sleeves and long pants tucked into socks. Wear a hat, and tie hair back.
- Use insecticides to repel or kill ticks. Repellents containing the compound n,n-diethyl-meta-toluamide (DEET) can be used on exposed skin except for the face, but they do not kill ticks and are not 100% effective in discouraging ticks from biting. Products containing permethrin kill ticks, but they cannot be used on the skin -- only on clothing. When using any of these chemicals, follow label directions carefully.

- After outdoor activities, perform a tick check. Check body areas where ticks are commonly found: behind the knees, between the fingers and toes, under the arms, in and behind the ears, and on the neck, hairline, and top of the head. Check places where clothing presses on the skin.
- Remove attached ticks promptly. Removing a tick before it has been attached for more than 24 hours greatly reduces the risk of infection. Use tweezers and grab as closely to the skin as possible. Do not try to remove ticks by squeezing them, coating them with petroleum jelly, or burning them with a match. Keep ticks in a zip-lock baggie in case testing needs to be performed.
- Report any of the above symptoms and all tick bites to the PM and Safety Team for evaluation.

4.5.2 Mosquito- Borne Disease – West Nile Virus

West Nile encephalitis is an infection of the brain caused by the West Nile virus, which is transmitted by infected mosquitoes. Following transmission from an infected mosquito, West Nile virus multiplies in the person's blood system and crosses the blood-brain barrier to reach the brain. The virus interferes with normal CNS functioning and causes inflammation of the brain tissue. However, most infections are mild, and symptoms include fever, headache, and body aches. More severe infections may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and rarely, death. Persons over the age of 50 have the highest risk of severe disease.

Prevention centers on public health action to control mosquitoes and on individual action to avoid mosquito bites. To avoid being bitten by the mosquitoes that cause the disease, use the following control measures:

If possible, stay inside between dusk and dark. This is when mosquitoes are most active. When outside (between dusk and dark), wear long pants and long-sleeved shirts. Spray exposed skin with an insect repellent, preferably containing DEET.

4.5.3 Wasps and Bees

Wasps (hornets and yellow-jackets) and bees (honeybees and bumblebees) are common insects that may pose a potential hazard to the field team if work is performed during spring, summer, or fall. Bees normally build their nests in the soil. However, they use other natural holes such as abandoned rodent nests or tree hollows. Wasps make a football-shaped, paper-like nest either below or above the ground. Yellow-jackets tend to build their nests in the ground, but hornets tend to build their nests in trees and shrubbery. Bees are generally more mild-mannered than wasps and are less likely to sting. Bees can only sting once while wasps sting multiple times because their stinger is barbless. Wasps sting when they feel threatened.

By remaining calm and not annoying wasps by swatting, you lessen the chance of being stung.

Wasps and bees inject a venomous fluid under the skin when they sting. The venom causes a painful swelling that may last for several days. If the stinger is still present, carefully remove it with tweezers. Some people may develop an allergic reaction (i.e. anaphylactic shock) to a wasp or bee sting. If such a reaction develops, seek medical attention at once. If a GEI employee is allergic to bees or wasps notify the SSM and if, needed, the location of the epi pen.

4.5.4 Sun Exposure

Employees are encouraged to liberally apply sunscreen, with a minimum broad-spectrum sun protection factor (SPF) of 30, when working outdoors to avoid sunburn and potential skin cancer, which is associated with excessive sun exposure to unprotected skin. Additionally, employees should wear safety glasses that offer protection from ultraviolet A and B (UVA/UVB) rays.

5. Personal Protective Equipment

The PPE specified in Table 4 represents PPE selection required by 29 CFR 1910.132, and is based on the Activity Hazard Analysis of Section 4 (Table 2). Specific information on the selection rationale activity can be found in the GEI Health and Safety Manual.

The PPE program addresses elements, such as PPE selection based on site hazards, use and limitations, donning and doffing procedures, maintenance and storage, decontamination and disposal, training and proper fitting, inspection procedures prior to / during / and after use, evaluation of the effectiveness of the PPE program, and limitations during temperature extremes, heat stress, and other appropriate medical considerations. A summary of PPE for each level of protection is in Table 4.

Table 4. Site-Specific PPE

Task	PPE Level	Site-Specific Requirements	Respirator
Operation & Maintenance			
Sub-slab depressurization system	D	Hard hat, safety glasses, steel toe/shank safety boot, reflective vest, leather work gloves, hearing protection as needed	D - None
Construction			
Drilling, Groundwater Well Installation, Excavation, Digging Test Pits, Backfilling, Grading Observation, Sampling	D	Hard hat, safety glasses, steel toe/shank safety boot with overboot as needed, reflective vest, leather work gloves as needed, nitrile gloves, hearing protection as needed, face coverings when required.	D - None
Hazardous Materials Assessment			
Sampling: Groundwater and Soil Vapor	D	Hard hat, safety glasses, steel toe/shank safety boot with overboot as needed, reflective vest, leather work gloves as needed, nitrile gloves, hearing protection as needed, face coverings when required.	D - None

Use of Level A or Level B PPE is not anticipated. If conditions indicating the need for Level A or Level B PPE are encountered, personnel will leave the site and this HASP will be revised with oversight of the Safety Director or GEI personnel will not re-enter the site until conditions allow.

For most work conducted at the site, Level D PPE will include long pants, hard hats, safety glasses with side shields, and steel toe/shank or EH-rated safety boots.

5.1 OSHA Requirements for PPE

Personal protective equipment used during the course of this field investigation must meet the following OSHA standards:

Table 5. OSHA Standards for PPE

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133	ANSI Z87.1 1968
Respiratory	29 CFR 1910.134	ANSI Z88.1 1980
Head	29 CFR 1910.135	ANSI Z89.1 1969
Foot	29 CFR 1910.136	ANSI Z41.1 1999 or ASTM F-2412-2005, and ASTM F-2413-2005

CRF = Code of Federal Regulations
ANSI = American National Standards Institute
ASTM = American Society for Testing and Materials

On-site GEI personnel who have the potential to don a respirator must have a valid fit test certification and documentation of medical clearance. The Safety Director will maintain such information on file for on-site personnel. The PM will obtain such information from the subcontractor's site supervisor prior to the initiation of such work. Both the respirator and cartridges specified for use in Level C protection must be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910.134). Air purifying respirators cannot be worn under the following conditions:

- Oxygen deficiency (less than 20.7%).
- Imminent Danger to Life and Health (IDLH) concentrations.
- If contaminant levels exceed designated use concentrations.

6. Key Project Personnel/Responsibilities and Lines of Authority

6.1 GEI Personnel

- Nicholas J. Recchia — Project Manager
- Michael Bohuski — Project Engineer
- Nicholas J. Recchia — Site Safety Manager
- TBD — Field Personnel
- Steve Hawkins — Safety Director
- Jeena Sheppard — Regional Safety Manager

The implementation of health and safety at this project location will be the shared responsibility of the PM, the Safety Director, Regional Safety Manager, the Site Safety Manager (SSM), other GEI personnel implementing the proposed scope of work.

6.1.1 GEI Project Manager

The PM is responsible for confirming that the requirements of this HASP are implemented. Some of the PM's specific responsibilities include:

- Conducting and documenting the Project Safety Briefing for GEI project employees and forwarding the signed form (Appendix D) to the Safety Team;
- Verifying that the GEI staff selected to work on this program are sufficiently trained for site activities;
- Assuring that personnel to whom this HASP applies, including subcontractor personnel, have received a copy of it;
- Providing the Safety Director with updated information regarding conditions at the site and the scope of site work;
- Providing adequate authority and resources to the on-site SSM to allow for the successful implementation of necessary safety procedures;
- Supporting the decisions made by the SSM and Safety Director;
- Maintaining regular communications with the SSM and, if necessary, the Safety Director;
- Verifying that the subcontractors selected by GEI to work on this program have completed GEI environmental, health and safety requirements and has been deemed acceptable for the proposed scope of work; and

- Coordinating the activities of GEI subcontractors and confirming that they are aware of the pertinent health and safety requirements for this project.

6.1.2 GEI Safety Director

The Safety Director is the individual responsible for the review, interpretation, and modification of this HASP. Modifications to this HASP which may result in less stringent precautions cannot be undertaken by the PM or the SSM without the approval of the Safety Director. Specific duties of the Safety Director include:

- Writing, approving, and amending the HASP for this project;
- Advising the PM and SSM on matters relating to health and safety on this site;
- Recommending appropriate PPE and safety equipment to protect personnel from potential site hazards;
- Conducting accident investigations; and
- Maintaining regular contact with the PM and SSM to evaluate site conditions and new information which might require modifications to the HASP.

6.1.3 GEI Site Safety Manager

GEI field staff are responsible for implementing the safety requirements specified in this HASP. However, one person will serve as the SSM. The SSM will be on-site during all activities covered by this HASP. The SSM is responsible for enforcing the requirements of this HASP once work begins. The SSM has the authority to immediately correct situations where noncompliance with this HASP is noted and to immediately stop work in cases where an immediate danger is perceived. Some of the SSM's specific responsibilities include:

- Conducting/attending the Project Safety Briefing prior to beginning work, and subsequent safety meetings as necessary;
- Conduct Safety Tailgate meeting (can be combined with "pre-entry") briefing for site-related work;
- Verifying that personnel to whom this HASP applies have attended and participated in the Project Safety Briefing and subsequent safety meetings that are conducted during the implementation of the program;
- Maintaining a high level of health and safety consciousness among employees implementing the proposed activities;
- Procuring the air monitoring instrumentation required and performing air monitoring for investigative activities;
- Procuring and distributing the PPE and safety equipment needed for this project for GEI employees;

- Verifying that PPE and health and safety equipment used by GEI is in good working order;
- Verifying that the selected contractors are prepared with the correct PPE and safety equipment and supplies;
- Notifying the PM of noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of personnel within the established restricted areas to confirm that required safety and health procedures are being followed;
- Stopping work in the event that an immediate danger situation is perceived; and
- Reporting accident/incident and preparing accident/incident reports, if necessary.

6.1.4 GEI Field Personnel

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

- Reading and signing the HASP in its entirety prior to the start of on-site work;
- Attending and actively participating in the required Project Safety Briefing prior to beginning on-site work and any subsequent safety meetings that are conducted during the implementation of the program;
- Stopping work in the event that an immediate danger situation is perceived;
- Bringing forth any questions or concerns regarding the content of the HASP to the PM or the SSM, prior to the start of work;
- Reporting accidents, injuries, and illnesses, regardless of their severity, to the SSM, Safety Director, and HR; and
- Complying with the requirements of this HASP and the requests of the SSM.

6.1.5 Lines of Authority will be as follows:

On site – GEI will have responsibility for safety of its employees during the work performed at the site. GEI's field representative will have a cell phone available to contact the appropriate local authorities, in the event of an emergency. GEI's field representative will be available for communication with the GEI PM and with the Client's representative.

GEI employees have the authority to stop work activities if an unanticipated hazard is encountered or a potential unsafe condition is observed. The GEI employee should contact the Safety Director and the Project Manager to discuss the stop work conditions and potential control methods that can be implemented.

7. Training Requirements

7.1 HAZWOPER Training

In accordance with OSHA Standard 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response" (HAZWOPER) responders will, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations. At a minimum, the training will have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training will not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical). Proof of training will be submitted to the PM or his/her representative prior to the start of field activities.

7.2 Annual 8-Hour Refresher Training

Annual 8-hour refresher training will be required of hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 29 CFR 1910.120 requirements and related company programs and procedures. Proof of current 8-hour refresher training will be submitted to the PM or his/her representative prior to the start of field activities.

7.3 Supervisor Training

Personnel acting in a supervisory capacity will have received 8 hours of instruction in addition to the initial 40-hour training. In addition, supervisors will have 1 year of field experience and training specific to work activities (i.e., sampling, construction observation, etc.)

7.4 Site-Specific Training

Prior to commencement of field activities, the PM or the SSM will verify GEI field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards, and emergency services at the site, and will highlight the provisions contained within this HASP and applicable GEI H&S SOPs (Appendix E). This training will be documented on the Project Safety Briefing Form Appendix D). The signed form will be forwarded to the Safety Team at SafetyTeam@geiconsultants.com. In addition, GEI personnel will sign the plan to document that they understand the hazards and control measures presented and agree to comply with the procedures established in the HASP. Personnel that have not received project-specific training will not be allowed on-site.

7.5 On-Site Safety Briefings

Other GEI personnel will be given health and safety briefings daily by the SSM or field representative to assist GEI personnel in safely conducting work activities. The briefing will include GEI subcontractors. The briefings can include information on new operations to be conducted, changes in work practices, or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. Documentation of these briefings will be recorded in the GEI field book, if the project duration is less than 5 days. If the project is longer than 5 days, the Tailgate Safety Briefing Form (Appendix D) will be used to document briefings. The meetings will also be an opportunity to periodically update the employees on monitoring results.

7.6 First Aid and CPR

The PM will verify that GEI field staff has current certifications in first aid and Cardiopulmonary Resuscitation (CPR), so that emergency medical treatment is available during field activities. The training will be consistent with the requirements of the American Red Cross Association. GEI employees also attend annual Bloodborne Pathogens training in compliance with OSHA regulations.

8. Medical Surveillance Program

GEI maintains a continuous, corporate, medical surveillance program that includes a plan designed specifically for field personnel engaged in work at sites where hazardous or toxic materials may be present. GEI's Safety Director and is responsible for the administration and coordination of medical evaluations conducted for GEI's employees at branch office locations. Comprehensive examinations are given to GEI field personnel on an annual or biennial basis (as determined to be appropriate by the Safety Director) participating in hazardous waste operations. The medical results of the examinations aid in determining the overall fitness of employees participating in field activities.

Under the Safety Director's supervision, field personnel undergo a complete initial physical examination, including a detailed medical and occupational history, before they participate in hazardous waste site investigations. Extensive annual/biennial reexaminations are also performed. Upon completion of these tests, personnel are certified by an occupational health physician as to whether they are fit for field work in general and fit to use respiratory protection.

If a GEI employee or other project worker shows symptoms of exposure to a hazardous substance and wishes to be rechecked, he/she will be directed to the nearest area hospital or medical facility.

GEI subcontractor personnel that will enter any active waste handling or other active non-"clean" area must certify that they are participating in a medical surveillance program that complies with OSHA regulations for hazardous waste operations (i.e., 29 CFR 1910.120 and 29 CFR 1926.65). Proof of medical clearance will be submitted to the GEI PM or SSM prior to the start of field activities.

9. Atmospheric Monitoring

Air monitoring will be performed to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of worker protection needed on-site in the event that intrusive work is conducted. Work requiring air monitoring includes the installation and/or abandonment of monitoring wells, DNAPL recovery wells, oxygen injection wells, and soil vapor points. Additionally, PID screening of the well head space will be conducted during groundwater sampling activities.

GEI will conduct work zone monitoring for on-site GEI employees during intrusive activities only. GEI will monitor and document daily site conditions and operations and inform field representatives of results. ***If Action Levels are exceeded, the SSM will immediately implement site action(s) according to Table 6 below and notify the PM and Safety Team***.

The following air monitoring equipment will be on site:

- PID with 10.6 eV lamp or equivalent
- Particulate Meter (PM-10 capable)

9.1 Equipment Use

9.1.1 Calibration

Air monitoring equipment will be calibrated and maintained in accordance with manufacturer's requirements. Calibrations will be recorded in the project notes daily or on a daily calibration form.

9.1.2 Photoionization Detector

Organic vapor concentrations will be measured using a PID during intrusive activities. During intrusive operations, organic vapor concentrations will be measured continuously. Organic vapor concentrations will be measured upwind of the work site(s) to determine background concentrations at least twice a day, (once in the morning and once in the afternoon). The SSM will interpret monitoring results using professional judgment and according to the alert and Action Limits set forth in the associated Site Work Plan.

9.2 Particulate Meter

A particulate meter will be used to measure airborne particulate matter during intrusive activities. Monitoring will be continuous, and readings will be averaged over a 15-minute period for comparison with the Action Levels. Monitoring personnel will make a best effort

to collect dust monitoring data from downwind of the intrusive activity. If off-site sources are considered to be the source of the measured dust, upwind readings will also be collected.

9.3 Action Levels

Table 6 provides a summary of real time air monitoring Action Levels and contingency plans for work zone activities. The below Action Levels are determined by halving the Permissible Exposure Limits (PELs) or Threshold Limit Values (TLVs) as set forth by OSHA and the American Conference of Government Industrial Hygienists (ACGIH). O_2 values are based on the maximum use limits of a full-face respirator if oxygen were being displaced by a chemical.

Table 6. Real-Time Work Zone Air Monitoring Action Levels

Air Monitoring Instrument	Action Level (above background)	Site Action
PID	1.0 ppm	Use detector tube for benzene or zNose to verify if concentration is benzene. No respiratory protection is required if benzene is not present.
PID	1.0 - 10 ppm	Use Sensodyne detector tube for naphthalene or zNose to verify if concentration is naphthalene. No respiratory protection is required if naphthalene is not present.
	10 – 50 ppm	No respiratory protection is required if benzene or naphthalene is not present.
	50 – 100 ppm	Stop work, withdrawal from work area, institute engineering controls, if levels persist, upgrade to Level C.
	> 100 ppm	Stop work, withdraw from work area, notify PM and Safety Team.
O_2 Meter	< 20.7%	Stop work, withdraw from work area, ventilate area, notify PM and Safety Team.
	> 21.1%	Stop work, withdraw from work area, notify PM and Safety Team.
H_2S Meter	< 5.0 ppm	No respiratory protection is required.
	> 5.0 ppm	Stop work, cover excavation, withdraw from work area, institute engineering controls, notify PM and Safety Team.
HCN Meter	< 1.0 ppm	Run CMS Drager tube. Continue monitoring with real-time meter and continue work if CMS Drager tube reading is less than 2.0 ppm.
	> 1.0 ppm HCN Concentrations < 2.0 ppm	Run CMS Drager tube and confirm concentration is less than 2.0 ppm, notify PM and Safety Team. Run CMS tube for sulfur dioxide, hydrogen sulfide, and phosphine chip potential interferences. Continue to monitor with real-time meter.
	> 2.0 ppm	Stop work and move (with continuous HCN monitoring meter) at lease 25 ppm upwind of the excavation until continuous meter reads less than 1 ppm, notify PM and Safety Team. Run CMS Drager hydrogen cyanide chip and re-evaluate activity, continue monitoring with a real-time meter, resume work if concentrations read less than 1.0 ppm.

Table 6. Real-Time Work Zone Air Monitoring Action Levels

Air Monitoring Instrument	Action Level (above background)	Site Action
Lower Explosive Limit	< 10% LEL	Investigate possible causes, allow excavation to ventilate, use caution during procedures.
	> 10% LEL	Stop work, allow excavation/borehole to ventilate to < 10% LEL, if ventilation does not result in a decrease to < 10% LEL, withdraw from work area, notify PM and Safety Team.
Carbon Monoxide	> 35 ppm	Stop work, withdraw from work area, ventilate area, notify PM and Safety Team.
Particulate Meter	150 µg/m^3	Implement work practices to reduce/minimize airborne dust generation, e.g., spray/misting of soil with water.

10. Site Control

10.1 Buddy System

GEI personnel should be in line-of-site or communication contact with another on-site person. The other on-site person should be aware of his or her role as a "buddy" and be able to help in the event of an emergency. A copy of this plan will be given to any person acting as a GEI "buddy" for informational purposes.

10.2 Sanitation for Temporary Work Sites

Sanitation requirements identified in the OSHA Standard 29 CFR 1926.51 "Sanitation" specifies that employees working at temporary project sites have at least one sanitary facility available to them. Sanitary facilities are located within the on-Site buildings.

10.3 Illumination

Illumination requirements identified by OSHA are directed to work efforts inside buildings and/or during non-daylight hours. Activities planned for the site are anticipated to occur outside during daylight hours. However, if work areas do not meet illumination requirements, they will be equipped with appropriate illumination that meets or exceeds requirements specified in OSHA Standard 29 CFR 1926.56 "Illumination." Employees will not work on sites that are not properly lighted.

10.4 Smoking

Smoking is prohibited at or in the vicinity of hazardous operations or materials. Where smoking is permitted, safe receptacles will be provided for smoking materials.

10.5 Alcohol and Drug Abuse Prevention

Alcohol and drugs will not be allowed on the site. Project personnel under the influence of alcohol or drugs will not be allowed to enter the site.

11. Incident Reporting

GEI will report incidents involving GEI personnel or subcontractor personnel, such as: lost time injuries, injuries requiring medical attention, near miss incidents, fires, fatalities, accidents involving the public, chemical spills, vehicle accidents, and property damage. The following steps must be followed when an incident occurs:

1. For incidents involving life-threatening situations or serious injury that require emergency response personnel (Police, Fire, EMS), call 9-1-1 from a safe area.
2. **Stop work** activity to address any injury, illness, property damage, spill or other emergency.
3. Call Medcor Triage at 1-800-775-5866 to speak with a medical professional following any injury or illness.
4. Notify your Supervisor/Project Manager of the incident or injury.
5. Complete an incident report using the GEI Incident Report Form located on the GEI Safety Smartphone App, GEI Connections intranet page, or in the project HASP.
6. Resume work activity if all steps above have been completed and it is safe to do so.

For vehicle accidents involving another vehicle or damage to property, the employee will take pictures of each vehicle or property involved in the incident and obtain a police report. In some municipalities police will not be dispatched to a non-injury accident, but every effort needs to be made to try and obtain the report.

The Incident Report Form and the Near Miss Reporting Form can be found in Appendix D, on the GEI Health and Safety smartphone app, or on the Safety page of the GEI Intranet. To report subcontractor injuries or incidents, follow the same verbal reporting procedures and submit an email describing the event to the PM and the Safety Team.

11.1 Injury Triage Service

If a GEI employee experiences a work-related injury that is not life-threatening, the employee will initiate a call to Medcor Triage at 1-800-775-5866. The injured employee will detail any medical symptoms or complaints which will be evaluated by a Registered Nurse (RN) specially trained to perform telephonic triage. The RN will recommend first aid self-treatment or refer the injured employee for an off-site medical evaluation by a health professional at a clinic within GEI's workers compensation provider network. GEI employees are still required to follow our Accident Reporting procedures as listed above.

12. Decontamination Procedures

12.1 Decontamination Equipment Requirements

The following equipment, if required, should be in sufficient supply to implement decontamination procedures for GEI's equipment.

- Buckets
- Alconox detergent concentrate
- Hand pump sprayers
- Long handled soft bristle brushes
- Large sponges
- Cleaning wipes for respirators
- Bench or stool(s)
- Methanol and/or Nitric Acid
- Liquid detergent and paper towels
- Plastic trash bags

13. Supplemental Contingency Plan Procedures

13.1 Hazard Communication Plan

GEI personnel have received hazard communication training as part of their annual health and safety training and new employee health and safety orientation training. Hazardous materials used on the site will be properly labeled, stored, and handled. SDS will be available to potentially exposed employees.

13.2 Fire

In the event of a fire personnel will evacuate the area. GEI's field representative will contact the local fire department with jurisdiction and report the fire. Notification of evacuation will be made to the PM and the Safety Team. The field representative will account for GEI personnel and subcontractor personnel and report their status to the PM.

13.3 Medical Support

In case of minor injuries, on-site care will be administered with the site first aid kit. For serious injuries, call 911 and request emergency medical assistance. Seriously injured persons should not be moved, unless they are in immediate danger. Notify the PM and the Safety Team of the emergency.

Section 1 and Table 1 of this HASP contain detailed emergency information, including directions to the nearest hospital, and a list of emergency services and their telephone numbers. In addition, Appendix A includes maps to the hospital and/or occupational health clinic. GEI field personnel will carry a cellular telephone.

13.4 Severe Weather

The contingency plan for severe weather includes reviewing the expected weather to determine if severe weather is in the forecast. Severe weather includes high winds over 40 miles per hour (mph), heavy rains or snow squalls, thunderstorms, tornados, and lightning storms. If severe weather is approaching, the decision to evacuate GEI personnel and subcontractor personnel from the site will be the responsibility of GEI's field representative. Notification of evacuation will be made to the PM and the Safety Team. The field representative will account for GEI personnel and subcontractor personnel and report their status to the PM. If safe, work can resume 30 minutes after the last clap of thunder or flash of lightening.

13.5 Spills or Material Release

If a hazardous waste spill or material release occurs, if safe, the SSM or their representative will immediately assess the magnitude and potential seriousness of the spill or release based on the following:

- SDS for the material spilled or released;
- Source of the release or spillage of hazardous material;
- An estimate of the quantity released and the rate at which it is being released;
- The direction in which the spill or air release is moving;
- Personnel who may be or may have been in contact with the material, or air release, and possible injury or sickness as a result;
- Potential for fire and/or explosion resulting from the situation; and
- Estimates of area under influence of release.

If the spill or release is determined to be within the on-site emergency response capabilities, the SSM will verify implementation of the necessary remedial action. If the release is beyond the capabilities of the site personnel, personnel will be evacuated from the immediate area and the local fire department will be contacted. The SSM will notify the PM and the Safety Team.

14. Health and Safety Plan Sign-Off

GEI personnel conducting site activities will be familiar with the information in this HASP. After reviewing this plan, please sign the copy in the project files, and bring a copy of the plan with you to the site. By signing this site-specific HASP, you are agreeing that you have read, understand, and will adhere to the provisions described in this plan while working on the Project site below.

Site Name: 37-24 & 37-38 30th Street Redevelopment Site

Investigation: Site Management Plan

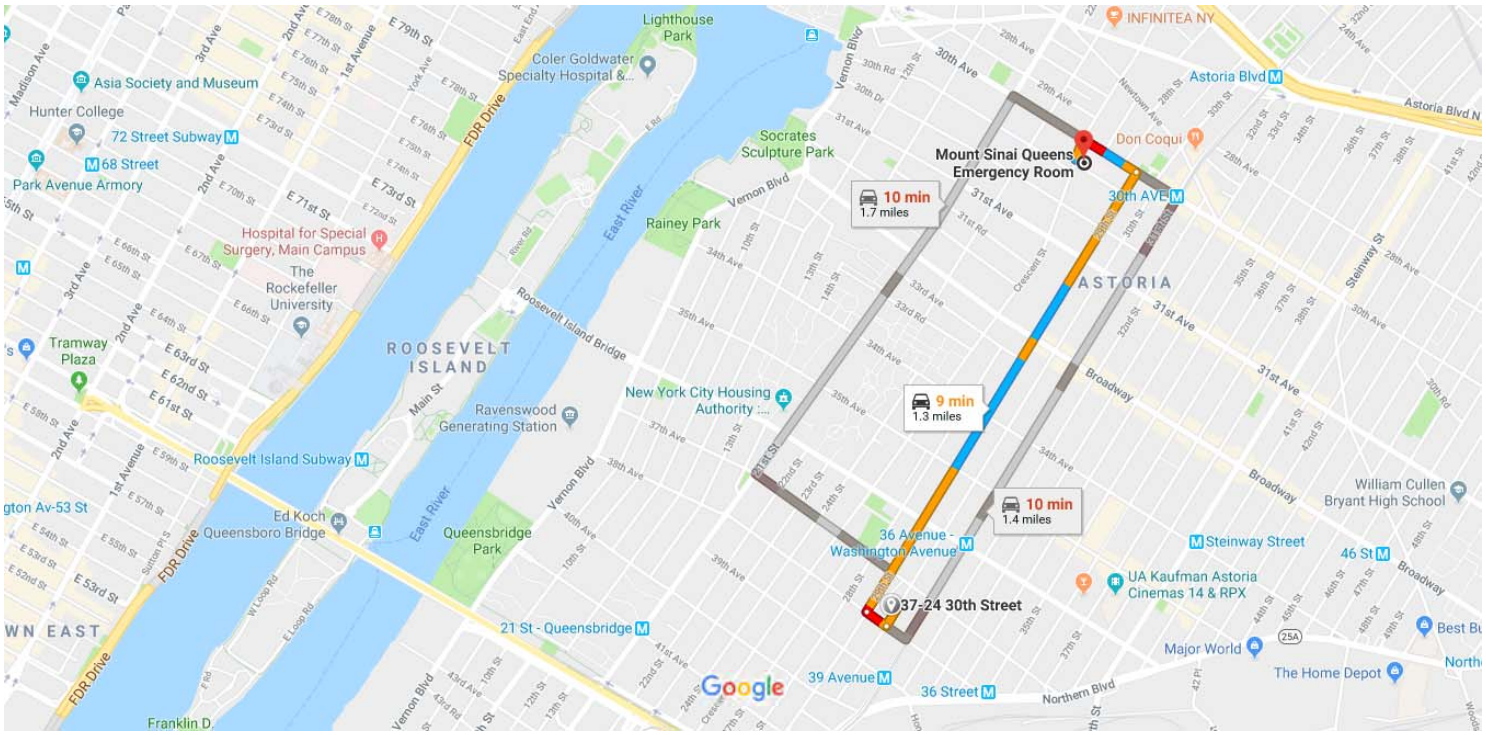
GEI Project No: 1800522

Print Name	Signature
Project Manager: Nick Recchia	

Appendix A

Map to Hospital and Occupational Health Clinic

Google Maps 37-24 30th St, Long Island City, NY 11101 to Mount Sinai Queens Emergency Room Drive 1.3 miles, 9 min



1. [illegible]
223 ft

2. Turn right at the 1st cross street onto 38th Ave
262 ft

3. Turn right onto 29th St
1.1 mi

4. Turn left onto 30th Ave
0.1 mi

5. Turn left onto Crescent St
Destination will be on the left
240 ft

Mount Sinai Queens Emergency Room

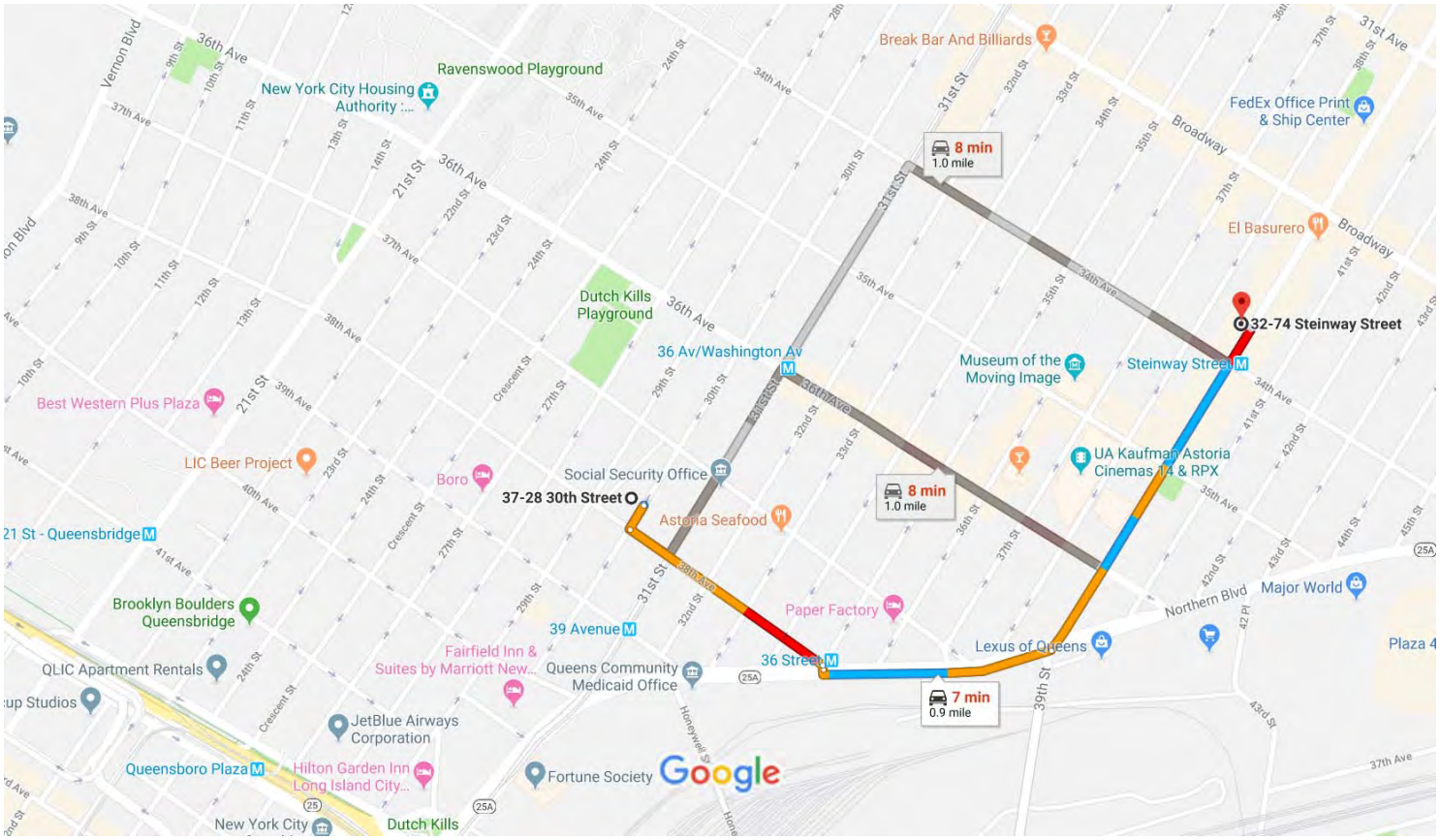
[illegible]

Google Maps

37-28 30th Street, Long Island City, NY to 32-74 Steinway Street, Astoria, NY

Drive 0.9 mile, 7 min

UMD Astoria Urgent Care



Map data ©2018 Google 500 ft

37-28 30th St

Long Island City, NY 11101

1. Head southwest on 30th St toward 38th Ave

151 ft

2. Turn left at the 1st cross street onto 38th Ave

Pass by 7-Eleven (on the right in 0.2 mi)

0.2 mi

3. Turn right to stay on 38th Ave

23 ft

4. Turn left at the 1st cross street onto Northern Blvd

0.2 mi

5. Use the left 2 lanes to turn left onto Steinway St

Destination will be on the left

0.4 mi

32-74 Steinway St

Astoria, NY 11103

Appendix B

Safety Data Sheets

Indoor Air Quality (IAQ)

Volatile Organic Compounds' Impact on Indoor Air Quality

On this page:

Introduction

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. VOCs are emitted by a wide array of products numbering in the thousands.

Organic chemicals are widely used as ingredients in household products. Paints, varnishes;and wax all contain organic solvents, as do many cleaning, disinfecting, cosmetic, degreasing and hobby products. Fuels are made up of organic chemicals. All of these products can release organic compounds while you are using them, and, to some degree, when they are stored.

EPA's Office of Research and Development's "Total Exposure Assessment Methodology (TEAM) Study" (Volumes I through IV, completed in 1985) found levels of about a dozen common organic pollutants to be 2 to 5 times higher inside homes than outside, regardless of whether the homes were located in rural or highly industrial areas. TEAM studies indicated that while people are using products containing organic chemicals, they can expose themselves and others to very high pollutant levels, and elevated concentrations can persist in the air long after the activity is completed.

Sources of VOCs

Household products, including:

- paints, paint strippersand other solvents
- wood preservatives
- aerosol sprays
- cleansers and disinfectants

- moth repellents and air fresheners
- stored fuels and automotive products
- hobby supplies
- dry-cleaned clothing
- pesticide

Other products, including:

- building materials and furnishings
- office equipment such as copiers and printers, correction fluids and carbonless copy paper
- graphics and craft materials including glues and adhesives, permanent markers and photographic solutions.

Health Effects

Health effects may include:

- Eye, nose and throat irritation
- headaches, loss of coordination and nausea
- damage to liver, kidney and central nervous system
- Some organics can cause cancer in animals, some are suspected or known to cause cancer in humans.

Key signs or symptoms associated with exposure to VOCs include:

- conjunctival irritation
- nose and throat discomfort
- headache
- allergic skin reaction
- dyspnea
- declines in serum cholinesterase levels
- nausea
- emesis
- epistaxis
- fatigue
- dizziness

The ability of organic chemicals to cause health effects varies greatly from those that are highly toxic, to those with no known health effect.

As with other pollutants, the extent and nature of the health effect will depend on many factors including level of exposure and length of time exposed. Among the immediate symptoms that some people have experienced soon after exposure to some organics include:

- Eye and respiratory tract irritation
- headaches
- dizziness
- visual disorders and memory impairment

At present, not much is known about what health effects occur from the levels of organics usually found in homes.

- Search EPA's Integrated Risk Information System (IRIS)
    - A compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects
- EPA's Office of Drinking Water Regulations
    - List of Contaminants and Their MCLs: Organic Chemicals
- U.S. Geology Survey's National Water-Quality Assessment (NAWQA) Program
    - Information on VOCs in Water Sources

Levels in Homes

Studies have found that levels of several organics average 2 to 5 times higher indoors than outdoors. During and for several hours immediately after certain activities, such as paint stripping, levels may be 1,000 times background outdoor levels.

Steps to Reduce Exposure

- Increase ventilation when using products that emit VOCs.
- Meet or exceed any label precautions.
- Do not store opened containers of unused paints and similar materials within the school.
- Formaldehyde, one of the best known VOCs, is one of the few indoor air pollutants that can be readily measured.
    - Identify, and if possible, remove the source.
    - If not possible to remove, reduce exposure by using a sealant on all exposed surfaces of paneling and other furnishings.
- Use integrated pest management techniques to reduce the need for pesticides.
- Use household products according to manufacturer's directions.
- Make sure you provide plenty of fresh air when using these products.
- Throw away unused or little-used containers safely; buy in quantities that you will use soon.
- Keep out of reach of children and pets.
- Never mix household care products unless directed on the label.

Follow label instructions carefully.

Potentially hazardous products often have warnings aimed at reducing exposure of the user. For example, if a label says to use the product in a well-ventilated area, go outdoors or in areas equipped with an exhaust fan to use it. Otherwise, open up windows to provide the maximum amount of outdoor air possible.

Throw away partially full containers of old or unneeded chemicals safely.

Because gases can leak even from closed containers, this single step could help lower concentrations of organic chemicals in your home. (Be sure that materials you decide to keep are stored not only in a well-ventilated area but are also safely out of reach of children.) Do not simply toss these unwanted products in the garbage can. Find out if your local government or any organization in your

community sponsors special days for the collection of toxic household wastes. If such days are available, use them to dispose of the unwanted containers safely. If no such collection days are available, think about organizing one.

Buy limited quantities.

If you use products only occasionally or seasonally, such as paints, paint strippers and kerosene for space heaters or gasoline for lawn mowers, buy only as much as you will use right away.

Keep exposure to emissions from products containing methylene chloride to a minimum.

Consumer products that contain methylene chloride include paint strippers, adhesive removers and aerosol spray paints. Methylene chloride is known to cause cancer in animals. Also, methylene chloride is converted to carbon monoxide in the body and can cause symptoms associated with exposure to carbon monoxide. Carefully read the labels containing health hazard information and cautions on the proper use of these products. Use products that contain methylene chloride outdoors when possible; use indoors only if the area is well ventilated.

Keep exposure to benzene to a minimum.

Benzene is a known human carcinogen. The main indoor sources of this chemical are:

- environmental tobacco smoke
- stored fuels
- paint supplies
- automobile emissions in attached garages

Actions that will reduce benzene exposure include:

- eliminating smoking within the home
- providing for maximum ventilation during painting
- discarding paint supplies and special fuels that will not be used immediately

Keep exposure to perchloroethylene emissions from newly dry-cleaned materials to a minimum.

Perchloroethylene is the chemical most widely used in dry cleaning. In laboratory studies, it has been shown to cause cancer in animals. Recent studies indicate that people breathe low levels of this chemical both in homes where dry-cleaned goods are stored and as they wear dry-cleaned clothing. Dry cleaners recapture the perchloroethylene during the dry-cleaning process so they can save money by re-using it, and they remove more of the chemical during the pressing and finishing processes. Some dry cleaners, however, do not remove as much perchloroethylene as possible all of the time.

Taking steps to minimize your exposure to this chemical is prudent.

- If dry-cleaned goods have a strong chemical odor when you pick them up, do not accept them until they have been properly dried.

- If goods with a chemical odor are returned to you on subsequent visits, try a different dry cleaner.

Standards or Guidelines

No federally enforceable standards have been set for VOCs in non-industrial settings. To learn more about VOC's, including current guidelines or recommendations set by various organizations for formaldehyde concentrations, visit Lawrence Berkeley National Laboratory's Indoor Air Quality Scientific Findings Resource Bank.

Additional Resources

- ASHRAE: Indoor Air Quality Guide, Strategies 5.1 and 5.2
- ASHRAE Standard 189.1-2014, Sections 10.3.1.4 and 10.3.1.4 (b) 1
- California Department of Public Health: Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers (Emission Testing Method for California Specification 01350)
- California Title 17 ATCM to Reduce Formaldehyde Emissions from Composite Wood Products
- Carpet and Rug Institute: Green Label Plus
- Collaborative for High Performance Schools: High Performance Products Database
- EPA: Formaldehyde Standards for Composite Wood Products
- Indoor Air Fact Sheet No. 4 (revised) - Sick Building Syndrome
    - Explains the term "sick building syndrome" (SBS) and "building related illness" (BRI). Discusses causes of sick building syndrome, describes building investigation procedures and provides general solutions for resolving the syndrome.
- Indoor Air Pollution: An Introduction for Health Professionals
    - Assists health professionals (especially the primary care physician) in diagnosis of patient symptoms that could be related to an indoor air pollution problem. Addresses the health problems that may be caused by contaminants encountered daily in the home and office. Organized according to pollutant or pollutant groups such as environmental tobacco smoke, VOCs, biological pollutants and sick building syndrome, this booklet lists key signs and symptoms from exposure to these pollutants, provides a diagnostic checklist and quick reference summary, and includes suggestions for remedial action. Also includes references for information contained in each section. This booklet was coauthored with the American Lung Association,

the American Medical Association and the U.S. Consumer Product Safety Commission.

Last updated on May 16, 2016

SVOCs and Health

Semivolatile organic compounds (SVOCs) are a subgroup of VOCs that tend to have a higher molecular weight and higher boiling point temperature than other VOCs. A comprehensive review of SVOCs in indoor environments, from which much of the below material is taken, is provided by Weschler and Nazaroff [92]. An additional overview is provided by Xu and Zhang [93]. Compounds considered to be SVOCs have boiling points ranging from 240-260 °C to 380-400°C. Despite these high boiling points, SVOCs such as plasticizers can vaporize from the surfaces of products containing them because they are not "bound" to the materials. They are present partly as gaseous airborne chemicals and partly as chemicals adsorbed on (attached reversibly to, without bonding) indoor surfaces and onto microscopic airborne and settled particles, although those with large molecular weight and low vapor pressures tend to predominate on surfaces and in dust [92]. SVOCs are ubiquitous in indoor environments, as they are released from multiple sources in the home and adsorb to all indoor surfaces.

People are exposed to SVOCs via multiple routes. They inhale air containing gaseous SVOCs or SVOCs adsorbed on airborne particles, they touch SVOC coated surfaces, they ingest dust containing SVOCs (a particularly important exposure route for infants), and the foods they eat contain SVOCs. Also, it has recently been recognized that airborne SVOCs can adsorb directly on the skin and then move into the body [94].

SVOCs that may be found in homes and other buildings, and also as detectable body burdens of occupants, include pesticides, plasticizers, and flame retardants. It has been calculated that many SVOCs have long persistence indoors. Even if the original sources are removed, SVOCs will persist indoors for weeks or years because all indoor surfaces have become coated with SVOCs. Calculations also indicate that human uptake of SVOCs by absorption on the skin can be much larger than previously thought, potentially equal to or in some cases exceeding intake through inhalation [95].

Less is known about SVOCs than VOCs in general, not because they are less important, but because they are more challenging to measure. Some SVOCs such as polycyclic aromatic hydrocarbons (PAHs), produced by combustion, have caused human exposures for millennia, whereas the manmade SVOCs have been present only on the order of decades. SVOCs are included as active ingredients in cleaning agents, pesticides, and personal care products, as well as substantial additives in floor coverings, furnishings, and electronic components. Food can also be a substantial, and sometimes, dominant sources of people's uptake of SVOCs. Because they are released slowly from their sources, adsorb readily onto surfaces, and can remain indoors for years after they are introduced, even if the original source is removed, they can be compared to outdoor persistent organic pollutants. The U.S. population has measurable levels in their bodies of more than 100 SVOCs (e.g., 95th

percentile values of 360, 270, 90, and 81 mg/g creatinine in urine for triclosan, DEHP, BBzP, and DBP, respectively, with body burdens of many others in common use not known, because they are not routinely measured.

The health effects of a specific SVOC depend on its chemical nature and on the degree of exposure, which can occur through a combination of ingestion, respiration, and skin absorption. Individual susceptibility factors can also be important, and much attention has been focused on the developing fetus. Knowledge about effects from indoor exposures to SVOCs is limited. Some SVOCs are known to be toxic, such as dioxins and pentachlorophenol; some are no longer used because of demonstrated or suspected health effects, such as polybrominated biphenyls; and concerns are emerging about potential health effects of others. Health effects now associated with specific SVOCs include allergic symptoms, retarded reproductive development, and altered semen quality with phthalates, and lower birth weight with perfluorooctane sulfonate and perfluorooctanoate. For instance, Hsu [96] found that allergy or asthma in children was associated in a significant, dose-response manner with increased levels of benzylbutyl phthalate in home dust. A broad and growing concern is about SVOCs with chemical structures that may mimic human hormones and increase or decrease endocrine activity. These SVOCs, called endocrine disrupting chemicals (EDCs), are discussed further below.

A substantial discussion of the occurrence, physical properties, and dynamics of SVOCs in indoor environments, with the goal of understanding human exposures indoors, is provided by Weschler and Nazaroff [92], along with information on typical U.S. body burdens of many compounds.

SVOCS that are considered to be endocrine-disrupting chemicals (EDCs) include polybrominated flame retardants, phthalates, pesticides, antimicrobials, and polycyclic aromatic hydrocarbons. EDCs can interfere with the "synthesis, secretion, transport, activity, or elimination of natural hormones," which can cause a wide range of developmental and reproductive abnormalities [97, 98]. Scientific observations suggest that, acting through a very wide variety of pathways in the body, EDCs may contribute to cancer, diabetes, obesity, and infertility [99] as well as autism and attention deficit disorder, although supporting evidence is limited. Exposures to EDCs in utero, when the fetus is developing, are of special concern because the development process may be affected by very small amounts of EDCs. Additional information on the range of EDCs, the evidence for their health effects, proposed mechanisms of action, and the difficulties of assessing the risks, is provided by Casals-Casas et al. [98].

Many brominated and chlorinated flame retardants, commonly used in many household items and electronics, are SVOCs and have been identified in the body burdens (e.g., in blood or urine) of human populations. They have also been associated with adverse health effects in animals and humans, including endocrine and thyroid disruption, immunotoxicity, reproductive toxicity, cancer, and adverse effects on fetal and child development and neurologic function [100]. Polybrominated diphenyl ethers (PBDEs) and other flame retardants have been banned or phased out by manufacturers because of their environmental persistence and toxicity, but they have been replaced by other chemicals of similar structure but unknown toxicity. A summary of the known toxic effects of commonly used flame retardants is provided by Shaw et al. [100]. A review of animal studies of brominated flame retardants, on the other hand, found that the available animal evidence is not sufficient to document a causal relationship between early exposures and later motor activity effects, and noted that human studies are generally lacking [101].

A recent review of the literature on indoor exposures and asthma exacerbations [46] summarized current evidence related to plasticizers and pesticides. For plasticizers, recent studies have demonstrated associations between the presence of plastic materials in homes and increased allergies, respiratory symptoms, and diagnosed asthma [40, 102-104], but have not evaluated effects on asthma exacerbation. No evidence was identified on the relationship of indoor pesticide exposures and asthma exacerbation. The review concluded that there was inadequate or insufficient evidence to determine whether or not an association existed between non-occupational exposure to plasticizers, or to pesticides, and exacerbations of asthma.

Summary

For SVOCs overall, there is persuasive evidence that they can cause a variety of adverse health effects, if the exposures are sufficient. The SVOC situation indoors is complex and continually changing. There are multiple SVOCs, multiple routes of exposures to SVOCs, and the timing of SVOC exposures can be important, with in-utero exposures a particular concern for EDCs. There is an ongoing process in which some SVOCs, strongly suspected to pose health risks, are phased out by manufacturers and replaced with new SVOCs with unknown risks. For some SVOCs, foods are considered the predominant source of exposure. At present, the extent of health risks from indoor airborne SVOCs, and from people's contact with indoor SVOC-contaminated surfaces, is uncertain.

Target Compound List – Semi-volatile Organic Compounds

Source: https://www.epa.gov/sites/production/files/2015-06/documents/8270.pdf

1,2-Dichlorobenzene
1,2,4-Trichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methylphenol
2-Nitroaniline
2-Nitrophenol
2,2'-oxybis (1-Chloropropane)
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,6-Dinitrotoluene
3-Nitroaniline
3,3'-Dichlorobenzidine
4-Bromophenyl-phenylether
4-Chloro-3-methylphenol
4-Chloroaniline
4-Chlorophenyl-phenyl ether
4-Methylphenol
4-Nitroaniline
4-Nitrophenol
4,6-Dinitro-2-methylphenol
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
bis(2-Chloroethoxy)-methane
bis(2-Chloroethyl) ether
bis(2-Ethylhexyl)phthalate
Butylbenzylphthalate
Carbazole
Chrysene
Di-n-butylphthalate
Di-n-octylphthalate
Dibenz(a,h)anthracene
Dibenzofuran
Diethylphthalate
Dimethylphthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-cd)pyrene
Isophorone
N-Nitroso-di-n-propylamine
N-nitrosodiphenylamine
Naphthalene
Nitrobenzene
Pentachlorophenol
Phenanthrene
Phenol
Pyrene

Polycyclic Aromatic Hydrocarbons (PAHs) - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). 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. 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: 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 (NPL) 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.

Polycyclic Aromatic Hydrocarbons

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.

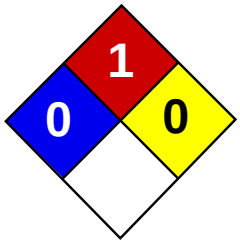
Where can I get more information?

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.



Health	0
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Anthracene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Anthracene

Catalog Codes: SLA3670

CAS#: 120-12-7

RTECS: CA9350000

TSCA: TSCA 8(b) inventory: Anthracene

CI#: Not available.

Synonym:

Chemical Formula: C14H10

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Anthracene	120-12-7	100

Toxicological Data on Ingredients: Anthracene LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of inhalation. Hazardous in case of skin contact (permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Very hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of inhalation. Hazardous in case of skin contact (permeator), of ingestion. CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Clear evidence.) by NTP, + (Proven.) by OSHA. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 540°C (1004°F)

Flash Points: CLOSED CUP: 121°C (249.8°F).

Flammable Limits: LOWER: 0.6%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Slight.

Taste: Not available.

Molecular Weight: 178.22 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 342°C (647.6°F)

Melting Point: 218°C (424.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.25 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 6.15 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Clear evidence.) by NTP, + (Proven.) by OSHA. Causes damage to the following organs: kidneys, lungs, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant, sensitizer), of inhalation. Hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Anthracene Massachusetts RTK: Anthracene TSCA 8(b) inventory: Anthracene SARA 313 toxic chemical notification and release reporting: Anthracene CERCLA: Hazardous substances.: Anthracene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R38- Irritating to skin. R41- Risk of serious damage to eyes. R43- May cause sensitization by skin contact. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 0

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 11:19 AM

Last Updated: 05/21/2013 12:00 PM

SAFETY DATA SHEET

Version 5.7
Revision Date 06/02/2016
Print Date 07/28/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benz[*a*]anthracene

Product Number : B2209
Brand : Aldrich
Index-No. : 601-033-00-9

CAS-No. : 56-55-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H350 May cause cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P391 Collect spillage.

P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	1,2-Benzanthracene Tetraphene
Formula	:	$C_{18}H_{12}$
Molecular weight	:	228.29 g/mol
CAS-No.	:	56-55-3
EC-No.	:	200-280-6
Index-No.	:	601-033-00-9

Hazardous components

Component	Classification	Concentration
Benz[a]anthracene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 157 - 159 °C (315 - 318 °F)
f)	Initial boiling point and boiling range	437.6 °C (819.7 °F)
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - > 200 mg/kg

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)
IARC:	2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)
NTP:	Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)
NTP:	Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[a]anthracene)
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene	56-55-3	2007-09-28
WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene	56-55-3	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling

or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.7 Revision Date: 06/02/2016 Print Date: 07/28/2016

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Revision Date 10-Feb-2015 **Revision Number** 1

1. Identification

Product Name **Benzo[a]pyrene, 98%**

Cat No. : **AC105600010; AC105601000**

Synonyms Benzo[def]chrysene.; 3,4-Benzopyrene; 3,4-Benzpyrene

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Sensitization	Category 1
Germ Cell Mutagenicity	Category 1A
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 1A

Label Elements

Signal Word
Danger

Hazard Statements
May cause an allergic skin reaction
May cause genetic defects
May cause cancer
May damage fertility or the unborn child

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Avoid breathing dust/fume/gas/mist/vapors/spray
Contaminated work clothing should not be allowed out of the workplace
Wear protective gloves
Response
IF exposed or concerned: Get medical attention/advice
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation or rash occurs: Get medical advice/attention
Wash contaminated clothing before reuse
Storage
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects

3. Composition / information on ingredients

Component	CAS-No	Weight %
Benzo[a]pyrene	50-32-8	> 96

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes.

Inhalation Move to fresh air.

Ingestion Do not induce vomiting.

Most important symptoms/effects May cause allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point
Method - No information available

Autoignition Temperature No information available
Explosion Limits

Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
None known
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions	See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up	No information available.

7. Handling and storage

Handling	Ensure adequate ventilation.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Benzo[a]pyrene		TWA: 0.2 mg/m^3	

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Benzo[a]pyrene	TWA: 0.005 mg/m^3		TWA:

Legend

OSHA - Occupational Safety and Health Administration

Engineering Measures	Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.
Respiratory Protection	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Dark yellow
Odor	aromatic
Odor Threshold	No information available
pH	
Melting Point/Range	175 179 °C
Boiling Point/Range	°C @ 760 mmHg
Flash Point	
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	No information available
Relative Density	No information available
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C20H12
Molecular Weight	252.31

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products None under normal use conditions

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Component Information

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Benzo[a]pyrene	50-32-8	Group 1	Reasonably Anticipated	A2	X	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
Endocrine Disruptor Information No information available

Component	EU - Endocrine Disrupters Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Benzo[a]pyrene	Group III Chemical	Not applicable	Not applicable

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Persistence and Degradability No information available
Bioaccumulation/ Accumulation No information available.

Mobility No information available.

Component	log Pow
Benzo[a]pyrene	6.06

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Benzo[a]pyrene - 50-32-8	U022	-

14. Transport information

DOT
UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.
Hazard Class 9
Packing Group III

TDG
UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.
Hazard Class 9
Packing Group III

IATA
UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.
Hazard Class 9
Packing Group III

IMDG/IMO
UN-No UN3077

Proper Shipping Name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.
Hazard Class	9
Packing Group	III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Benzo[a]pyrene	X	X	-	200-028-5	-		X	-	-	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Benzo[a]pyrene	50-32-8	> 96	0.1

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Benzo[a]pyrene	-	-	X	X

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Benzo[a]pyrene	1 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Benzo[a]pyrene	50-32-8	Carcinogen	0.06 µg/day	Carcinogen

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Benzo[a]pyrene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class D2A Very toxic materials

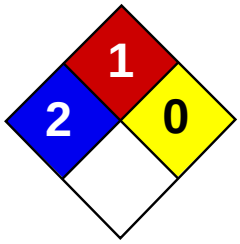
16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 10-Feb-2015
Print Date 10-Feb-2015
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS



Health	2
Fire	1
Reactivity	0
Personal Protection	C

Material Safety Data Sheet
Pyrene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Pyrene

Catalog Codes: SLP3868

CAS#: 129-00-00

RTECS: UR2450000

TSCA: TSCA 8(b) inventory: Pyrene

CI#: Not available.

Synonym: Benzo(D,E,F)phenanthrene

Chemical Name: Pyrene

Chemical Formula: C16-H10

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Pyrene	129-00-00	100

Toxicological Data on Ingredients: Pyrene: ORAL (LD50): Acute: 2700 mg/kg [Rat]. 800 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of heat, of combustible materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of heat. Non-explosive in presence of open flames and sparks.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested,

seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F). Preferably refrigerate.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Synthetic apron. Gloves (impervious).

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid. Powdered solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 202.26 g/mole

Color: Yellow.

pH (1% soln/water): Not applicable.

Boiling Point: 404°C (759.2°F)

Melting Point: 151.2°C (304.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.271 @ 23 C (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 4.9

Ionicity (in Water): Not available.

Dispersion Properties:
Is not dispersed in cold water, hot water. See solubility in diethyl ether.

Solubility:
Soluble in diethyl ether. Insoluble in cold water, hot water. Pyrene is fairly soluble in organic solvents. It is soluble in alcohol, benzene, carbon disulfide, ether, petroleum ether, and toluene

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 800 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenic). May cause cancer (tumorigenic) according to animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. May be absorbed through skin. Eyes: May cause eye irritation. Conjunctival irritation may be noted. Inhalation: May cause respiratory tract irritaiton. Ingestion: May cause gastrointestinal tract irritation. May affect behavior/Central Nervous System (excitation and muscel spasicity), liver and urinary system, and immune system, and blood.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 1.8 mg/l 48 hours [Water flea].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut carcinogen reporting list.: Pyrene Illinois chemical safety act: Pyrene New York release reporting list: Pyrene Pennsylvania RTK: Pyrene Massachusetts RTK: Pyrene Massachusetts spill list: Pyrene New Jersey: Pyrene New Jersey spill list: Pyrene Louisiana RTK reporting list: Pyrene Louisiana spill reporting: Pyrene California Director's list of Hazardous Substances: Pyrene TSCA 8(b) inventory: Pyrene TSCA 8(a) CAIR: Pyrene TSCA 8(d) H and S data reporting: Pyrene: June 1, 1987-June1, 1997 SARA 302/304/311/312 extremely hazardous substances: Pyrene CERCLA: Hazardous substances.: Pyrene: 5000 lbs. (2268 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R20/21/22- Harmful by inhalation, in contact with skin and if swallowed. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: C

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves (impervious). Synthetic apron. Not applicable. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:14 PM

Last Updated: 05/21/2013 12:00 PM

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lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

EPA United States Environmental Protection Agency

Types of Pesticide Ingredients

Pesticide active ingredients are described by the types of pests they control or how they work. People often use the term "pesticide" to refer only to insecticides, but it actually applies to all the substances used to control pests.

Well known pesticides include:

- insecticides,
- herbicides,
- rodenticides, and
- fungicides.

Less well-known pesticides include:

- disinfectants,
- attractants,
- plant defoliants,
- swimming pool treatments, and
- plant growth regulators.

The following list will help you understand the wide range of types of pesticides:

- Algicides kill algae in lakes, canals, swimming pools, water tanks, and other sites.
- Antifoulants kill or repel organisms that attach to underwater surfaces, such as barnacles that cling to boat bottoms.
- Antimicrobials kill microorganisms such as bacteria and viruses.
- Attractants lure pests to a trap or bait, for example, attract an insect or rodent into a trap. (However, food is not considered a pesticide when used as an attractant.)
- Biopesticides are derived from natural materials such as animals, plants, bacteria, and certain minerals.
- Biocides kill microorganisms.
- Defoliants cause leaves or foliage to drop from a plant, usually to facilitate harvest.
- Desiccants promote drying of living tissues, such as unwanted plant tops.
- Disinfectants and sanitizers kill or inactivate disease-producing microorganisms on inanimate objects.
- Fungicides kill fungi (including blights, mildews, molds, and rusts).
- Fumigants produce gas or vapor intended to destroy pests, for example in buildings or soil.
- Herbicides kill weeds and other plants that grow where they are not wanted.
- Insect growth regulators disrupt the molting, maturing from pupal stage to adult, or other life processes of insects.
- Insecticides kill insects and other arthropods.
- Miticides (also called acaricides) kill mites that feed on plants and animals.

- Microbial pesticides are microorganisms that kill, inhibit, or out-compete pests, including insects or other microorganism pests.
- Molluscicides kill snails and slugs.
- Nematicides kill nematodes (microscopic, worm-like organisms that feed on plant roots).
- Ovicides kill eggs of insects and mites.
- Pheromones disrupt the mating behavior of insects.
- Plant growth regulators alter the expected growth, flowering, or reproduction rate of plants (does not include fertilizers).
- Plant Incorporated Protectants are substances that plants produce from genetic material that has been added to the plant.
- Repellents repel pests, including insects (such as mosquitoes) and birds.
- Rodenticides control mice and other rodents.

Last updated on January 7, 2016

ATSDR Agency for Toxic Substances & Disease Registry

Polychlorinated Biphenyls (PCBs)

CAS ID #: 1336-36-3, 11097-69-1

Affected Organ Systems: Dermal (Skin), Developmental (effects during periods when organs are developing) , Endocrine (Glands and Hormones), Hepatic (Liver), Immunological (Immune System), Neurological (Nervous System)

Cancer Classification: NTP: Reasonably Anticipated to be a Human Carcinogen

Chemical Classification: Dioxins, Furans, PCBs (contain phenyl rings of carbon atoms), Pesticides (chemicals used for killing pests, such as rodents, insects, or plants)

Summary: 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.

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The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse, non-cancer health effects over a specified duration of exposure. The information in this MRL serves as a screening tool to help public health professionals decide where to look more closely to evaluate possible risk of adverse health effects from human exposure.

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- Page last reviewed: March 3, 2011
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- Content source: Agency for Toxic Substances and Disease Registry (http://www.atsdr.cdc.gov)

Agency for Toxic Substances and Disease Registry, 4770 Buford Hwy NE, Atlanta, GA 30341
Contact CDC: 800-232-4636 / TTY: 888-232-6348

Heavy Metals Toxicity and the Environment

Source: US National Library of Medicine National Institutes of Health

Abstract

Heavy metals are naturally occurring elements that have a high atomic weight and a density at least 5 times greater than that of water. Their multiple industrial, domestic, agricultural, medical and technological applications have led to their wide distribution in the environment, raising concerns over their potential effects on human health and the environment. Their toxicity depends on several factors including the dose, route of exposure, and chemical species, as well as the age, gender, genetics, and nutritional status of exposed individuals. Because of their high degree of toxicity, arsenic, cadmium, chromium, lead, and mercury rank among the priority metals that are of public health significance. These metallic elements are considered systemic toxicants that are known to induce multiple organ damage, even at lower levels of exposure. They are also classified as human carcinogens (known or probable) according to the U.S. Environmental Protection Agency, and the International Agency for Research on Cancer.

This review provides an analysis of their environmental occurrence, production and use, potential for human exposure, and molecular mechanisms of toxicity, genotoxicity, and carcinogenicity.

Introduction

Heavy metals are defined as metallic elements that have a relatively high density compared to water. With the assumption that heaviness and toxicity are inter-related, heavy metals also include metalloids, such as arsenic, that are able to induce toxicity at low level of exposure. In recent years, there has been an increasing ecological and global public health concern associated with environmental contamination by these metals. Also, human exposure has risen dramatically as a result of an exponential increase of their use in several industrial, agricultural, domestic and technological applications. Reported sources of heavy metals in the environment include geogenic, industrial, agricultural, pharmaceutical, domestic effluents, and atmospheric sources. Environmental pollution is very prominent in point source areas such as mining, foundries and smelters, and other metal-based industrial operations.

Although heavy metals are naturally occurring elements that are found throughout the earth's crust, most environmental contamination and human exposure result from anthropogenic activities such as mining and smelting operations, industrial production and use, and domestic and agricultural use of metals and metal-containing compounds. Environmental contamination can also occur through metal corrosion, atmospheric deposition, soil erosion of metal ions and leaching of heavy metals, sediment re-suspension and metal evaporation from water resources to soil and ground water. Natural phenomena such as weathering and volcanic eruptions have also been reported to significantly contribute to heavy metal pollution. Industrial sources include metal processing in refineries, coal burning in power plants, petroleum combustion, nuclear power stations and high tension lines, plastics, textiles, microelectronics, wood preservation and paper processing plants.

It has been reported that metals such as cobalt (Co), copper (Cu), chromium (Cr), iron (Fe), magnesium (Mg), manganese (Mn), molybdenum (Mo), nickel (Ni), selenium (Se) and zinc (Zn) are essential nutrients that are required for various biochemical and physiological functions. Inadequate supply of these micro-nutrients results in a variety of deficiency diseases or syndromes.

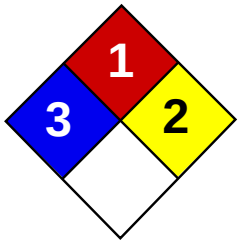
Heavy metals are also considered as trace elements because of their presence in trace concentrations (ppb range to less than 10 ppm) in various environmental matrices. Their bioavailability is influenced by physical factors such as temperature, phase association, adsorption and sequestration. It is also affected by chemical factors that influence speciation at thermodynamic equilibrium, complexation kinetics, lipid solubility and octanol/water partition coefficients. Biological factors such as species characteristics, trophic interactions, and biochemical/physiological adaptation, also play an important role.

The essential heavy metals exert biochemical and physiological functions in plants and animals. They are important constituents of several key enzymes and play important roles in various oxidation-reduction reactions. Copper for example serves as an essential co-factor for several oxidative stress-related enzymes including catalase, superoxide dismutase, peroxidase, cytochrome c oxidases, ferroxidases, monoamine oxidase, and dopamine β-monooxygenase. Hence, it is an essential nutrient that is incorporated into a number of metalloenzymes involved in hemoglobin formation, carbohydrate metabolism, catecholamine biosynthesis, and cross-linking of collagen, elastin, and hair keratin. The ability of copper to cycle between an oxidized state, Cu(II), and reduced state, Cu(I), is used by cuproenzymes involved in redox reactions. However, it is this property of copper that also makes it potentially toxic because the transitions between Cu(II) and Cu(I) can result in the generation of superoxide and hydroxyl radicals. Also, excessive exposure to copper has been linked to cellular damage leading to Wilson disease in humans. Similar to copper, several other essential elements are required for biologic functioning, however, an excess amount of such metals produces cellular and tissue damage leading to a variety of adverse effects and human diseases. For some including chromium and copper, there is a very narrow range of concentrations between beneficial and toxic effects. Other metals such as aluminium (Al), antinomy (Sb), arsenic (As), barium (Ba), beryllium (Be), bismuth (Bi), cadmium (Cd), gallium (Ga), germanium (Ge), gold (Au), indium (In), lead (Pb), lithium (Li), mercury (Hg), nickel (Ni), platinum (Pt), silver (Ag), strontium (Sr), tellurium (Te), thallium (Tl), tin (Sn), titanium (Ti), vanadium (V) and uranium (U) have no established biological functions and are considered as non-essential metals.

In biological systems, heavy metals have been reported to affect cellular organelles and components such as cell membrane, mitochondrial, lysosome, endoplasmic reticulum, nuclei, and some enzymes involved in metabolism, detoxification, and damage repair. Metal ions have been found to interact with cell components such as DNA and nuclear proteins, causing DNA damage and conformational changes that may lead to cell cycle modulation, carcinogenesis or apoptosis. Several studies from our laboratory have demonstrated that reactive oxygen species (ROS) production and oxidative stress play a key role in the toxicity and carcinogenicity of metals such as arsenic, cadmium, chromium, lead, and mercury. Because of their high degree of toxicity, these five elements rank among the priority metals that are of great public health significance.

They are all systemic toxicants that are known to induce multiple organ damage, even at lower levels of exposure. According to the United States Environmental Protection Agency (U.S. EPA), and the International Agency for Research on Cancer (IARC), these metals are also classified as either “known” or “probable” human carcinogens based on epidemiological and experimental studies showing an association between exposure and cancer incidence in humans and animals.

Heavy metal-induced toxicity and carcinogenicity involves many mechanistic aspects, some of which are not clearly elucidated or understood. However, each metal is known to have unique features and physic-chemical properties that confer to its specific toxicological mechanisms of action. This review provides an analysis of the environmental occurrence, production and use, potential for human exposure, and molecular mechanisms of toxicity, genotoxicity, and carcinogenicity of arsenic, cadmium, chromium, lead, and mercury.



Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

EPA United States Environmental Protection Agency

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Heavy metals are defined as metallic elements that have a relatively high density compared to water. With the assumption that heaviness and toxicity are inter-related, heavy metals also include metalloids, such as arsenic, that are able to induce toxicity at low level of exposure. In recent years, there has been an increasing ecological and global public health concern associated with environmental contamination by these metals. Also, human exposure has risen dramatically as a result of an exponential increase of their use in several industrial, agricultural, domestic and technological applications. Reported sources of heavy metals in the environment include geogenic, industrial, agricultural, pharmaceutical, domestic effluents, and atmospheric sources. Environmental pollution is very prominent in point source areas such as mining, foundries and smelters, and other metal-based industrial operations.

Although heavy metals are naturally occurring elements that are found throughout the earth's crust, most environmental contamination and human exposure result from anthropogenic activities such as mining and smelting operations, industrial production and use, and domestic and agricultural use of metals and metal-containing compounds. Environmental contamination can also occur through metal corrosion, atmospheric deposition, soil erosion of metal ions and leaching of heavy metals, sediment re-suspension and metal evaporation from water resources to soil and ground water. Natural phenomena such as weathering and volcanic eruptions have also been reported to significantly contribute to heavy metal pollution. Industrial sources include metal processing in refineries, coal burning in power plants, petroleum combustion, nuclear power stations and high tension lines, plastics, textiles, microelectronics, wood preservation and paper processing plants.

It has been reported that metals such as cobalt (Co), copper (Cu), chromium (Cr), iron (Fe), magnesium (Mg), manganese (Mn), molybdenum (Mo), nickel (Ni), selenium (Se) and zinc (Zn) are essential nutrients that are required for various biochemical and physiological functions. Inadequate supply of these micro-nutrients results in a variety of deficiency diseases or syndromes.

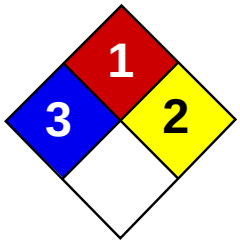
Heavy metals are also considered as trace elements because of their presence in trace concentrations (ppb range to less than 10 ppm) in various environmental matrices. Their bioavailability is influenced by physical factors such as temperature, phase association, adsorption and sequestration. It is also affected by chemical factors that influence speciation at thermodynamic equilibrium, complexation kinetics, lipid solubility and octanol/water partition coefficients. Biological factors such as species characteristics, trophic interactions, and biochemical/physiological adaptation, also play an important role.

The essential heavy metals exert biochemical and physiological functions in plants and animals. They are important constituents of several key enzymes and play important roles in various oxidation-reduction reactions. Copper for example serves as an essential co-factor for several oxidative stress-related enzymes including catalase, superoxide dismutase, peroxidase, cytochrome c oxidases, ferroxidases, monoamine oxidase, and dopamine β-monooxygenase. Hence, it is an essential nutrient that is incorporated into a number of metalloenzymes involved in hemoglobin formation, carbohydrate metabolism, catecholamine biosynthesis, and cross-linking of collagen, elastin, and hair keratin. The ability of copper to cycle between an oxidized state, Cu(II), and reduced state, Cu(I), is used by cuproenzymes involved in redox reactions. However, it is this property of copper that also makes it potentially toxic because the transitions between Cu(II) and Cu(I) can result in the generation of superoxide and hydroxyl radicals. Also, excessive exposure to copper has been linked to cellular damage leading to Wilson disease in humans. Similar to copper, several other essential elements are required for biologic functioning, however, an excess amount of such metals produces cellular and tissue damage leading to a variety of adverse effects and human diseases. For some including chromium and copper, there is a very narrow range of concentrations between beneficial and toxic effects. Other metals such as aluminium (Al), antinomy (Sb), arsenic (As), barium (Ba), beryllium (Be), bismuth (Bi), cadmium (Cd), gallium (Ga), germanium (Ge), gold (Au), indium (In), lead (Pb), lithium (Li), mercury (Hg), nickel (Ni), platinum (Pt), silver (Ag), strontium (Sr), tellurium (Te), thallium (Tl), tin (Sn), titanium (Ti), vanadium (V) and uranium (U) have no established biological functions and are considered as non-essential metals.

In biological systems, heavy metals have been reported to affect cellular organelles and components such as cell membrane, mitochondrial, lysosome, endoplasmic reticulum, nuclei, and some enzymes involved in metabolism, detoxification, and damage repair. Metal ions have been found to interact with cell components such as DNA and nuclear proteins, causing DNA damage and conformational changes that may lead to cell cycle modulation, carcinogenesis or apoptosis. Several studies from our laboratory have demonstrated that reactive oxygen species (ROS) production and oxidative stress play a key role in the toxicity and carcinogenicity of metals such as arsenic, cadmium, chromium, lead, and mercury. Because of their high degree of toxicity, these five elements rank among the priority metals that are of great public health significance.

They are all systemic toxicants that are known to induce multiple organ damage, even at lower levels of exposure. According to the United States Environmental Protection Agency (U.S. EPA), and the International Agency for Research on Cancer (IARC), these metals are also classified as either “known” or “probable” human carcinogens based on epidemiological and experimental studies showing an association between exposure and cancer incidence in humans and animals.

Heavy metal-induced toxicity and carcinogenicity involves many mechanistic aspects, some of which are not clearly elucidated or understood. However, each metal is known to have unique features and physic-chemical properties that confer to its specific toxicological mechanisms of action. This review provides an analysis of the environmental occurrence, production and use, potential for human exposure, and molecular mechanisms of toxicity, genotoxicity, and carcinogenicity of arsenic, cadmium, chromium, lead, and mercury.



Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic Pennsylvania RTK: Arsenic Massachusetts RTK: Arsenic TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:16 PM

Last Updated: 05/21/2013 12:00 PM

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Other Special Considerations: Not available.

Created: 10/09/2005 04:16 PM

Last Updated: 05/21/2013 12:00 PM

Beryllium: the essentials

Beryllium is a Group 2 (IIA) element. It is a metal and has a high melting point. At ordinary temperatures, beryllium resists oxidation in air. Beryllium compounds are very toxic. Its ability to scratch glass is probably due to the formation of a thin layer of the oxide. Aquamarine and emerald are precious forms of the mineral beryl, $[Be_3Al_2(SiO_3)_6]$.

Its chemistry is dominated by its tendency to lose an electron to form Be^{2+}. As this ion is so small it is highly polarising, to the extent that its compounds are rather covalent. Its small size means that its complexes tend to be tetrahedral rahter than octahedral.

- Name (../periodicity/name_english/): beryllium
- Symbol (../periodicity/name_english/): Be
- Atomic number (../periodicity/atomic_number/): 4
- Relative atomic mass (A_r) (../periodicity/atomic_weight/): 9.012182 (3)
- Standard state (../periodicity/standard_state/): solid at 298 K
- Colour (../periodicity/standard_state/): lead grey
- Classification (../periodicity/classification/): Metallic

- Group in periodic table (../periodicity/group_number/): 2
- Group name (../periodicity/group_number/): Alkaline earth metal
- Period in periodic table (../periodicity/group_number/): 2
- Block in periodic table (../periodicity/group_number/): s-block
- Electron shell structure (../periodicity/electron_shell_structure/): 2.2
- CAS Registry ID (../periodicity/cas_registry_id/): 7440-41-7

Beryllium: historical information

Beryllium was discovered (../periodicity/discovery/) by Nicholas Louis Vauquelin (1763-1829) in 1797 at France.
Origin of name (../periodicity/discovery/): from the Greek word "beryllos" meaning "beryl".
Emeralds and beryl were both known to early Egyptians but it was not realised until the end of the 18th century that they are the same mineral, now called beryllium aluminium silicate: $[Be_3Al_2(SiO_3)_6]$. The element was recognised by M.-L. Vauquelin in 1798 in beryl and emeralds. The metal was isolated much later on in 1828 by Friederich Wöhler (and independently by A.-A.B. Bussy) by the action of potassium on $BeCl_2$ in a platinum crucible.

Beryllium around us Read more » (./geology.html)

Beryllium has no biological role. In fact, compounds containing beryllium are poisonous.

Beryllium is found in a number of minerals. The most important minerals are beryl, [$Be_3Al_2(SiO_3)_6$], which is often found as hexagonal prisms, and bertrandite [$4BeO.2SiO_2.H_2O$]. Aquamarine and emerald are precious forms of beryl.

Abundances for beryllium in a number of different environments. More abundance data » (./geology.html)

Location	ppb by weight	ppb by atoms	Links
Universe (../periodicity/abundance_universe/)	1	0.1	 (../periodicity/abundance_universe/)
Crustal rocks (../periodicity/abundance_crust/)	1900	4300	 (../periodicity/abundance_crust/)
Human (../periodicity/abundance_humans/)	0.4 ppb by weight	0.3 atoms relative to C = 1000000	 (../periodicity/abundance_humans/)

Physical properties Read more » (./physics.html)

 Density of solid (../periodicity/density/): 1848 kg m^{-3}

 Molar volume (../periodicity/molar_volume/): 4.85 cm^3

 Thermal conductivity (../periodicity/thermal_conductivity/): 190 W m^{-1} K^{-1}

Heat properties Read more » (./thermochemistry.html)

 Melting point (../periodicity/melting_point/): 1560 [1287 °C (2349 °F)] K

 Boiling point (../periodicity/boiling_point/): 2742 [2469 °C (4476 °F)] K

 Enthalpy of fusion (../periodicity/enthalpy_fusion/): 7.95 kJ mol^{-1}

Crystal structure Read more » (./crystal_structure.html)

The solid state structure of beryllium is: hcp (hexagonal close-packed).

Beryllium: orbital properties Read more » (./atoms.html)

Beryllium atoms have 4 electrons and the shell structure (../periodicity/electron_shell_structure/) is 2.2. The ground state electronic configuration of neutral Beryllium is (../periodicity/electronic_configuration/) [He].$2s^2$ and the term symbol of Beryllium (../periodicity/term_symbol/) is $^1S_0$.


Pauling electronegativity (../periodicity/electronegativity_pauling/): 1.57 (Pauling units)


First ionisation energy (../periodicity/ionisation_energy_1/): 899.5 kJ mol^{-1}


Second ionisation energy (../periodicity/ionisation_energy_2/): 1757.1 kJ mol^{-1}

Isolation

Isolation (../periodicity/isolation/): beryllium metal is available commercially and so would never normally be made in the laboratory. Its extraction from ores is complex. The mineral beryl, $[Be_3Al_2(SiO_3)_6]$ is the most important source of beryllium. It is roasted with sodimu hexafluorosilicate, Na_2SiF_6, at 700°C to form beryllium fluoride. This is water soluble and the beryllium may be precipitated as the hydroxide $Be(OH)_2$ by adjustment of the pH to 12.

Pure beryllium may be obtained by electrolysis of molten $BeCl_2$ containing some NaCl. The salt is added since the molten $BeCl_2$ conducts very poorly. Another method involves the reduction of beryllium fluoride with magnesium at 1300°C.

$$BeF_2 + Mg \rightarrow MgF_2 + Be$$

Beryllium isotopes Read more » (./isotopes.html)

Table. Stables isotopes of beryllium (../periodicity/isotopes/).

Isotope	Mass /Da	Natural abund. (atom %)	Nuclear spin (I)	Nuclear magnetic moment (μ/μ_N)
^9Be	9.012 182 1(4)	100	$^3/_2$	-1.1779

WebElements chemistry shop

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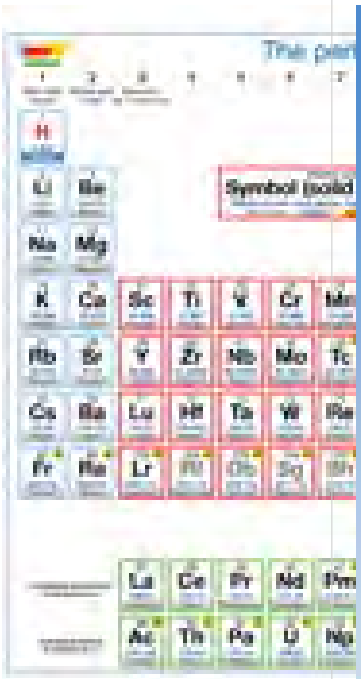

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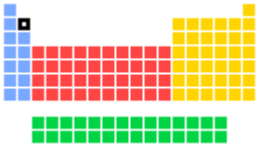

(../index.html)

H (../hydrogen/index.html)		
Li (../lithium/index.html)	Be	B (../boron/index.html)
Na (../sodium/index.html)	Mg (../magnesium/index.html)	Al (../aluminium/index.html)

Actinium (../actinium/)

Aluminium (../aluminium/)

Aluminum (../aluminium/)

Americium (../americium/)

Antimony (../antimony/)

Argon (../argon/)

Arsenic (../arsenic/)

Astatine (../astatine/)

Barium (../barium/)

Berkelium (../berkelium/)

Beryllium (../beryllium/)

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Meitnerium (../meitnerium/)

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Molybdenum (../molybdenum/)

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Thulium (../thulium/)

Tin (../tin/)

Titanium (../titanium/)

Tungsten (../tungsten/)

Uranium (../uranium/)

Vanadium (../vanadium/)

Xenon (../xenon/)

Ytterbium (../ytterbium/)

Yttrium (../yttrium/)

Zinc (../zinc/)

Zirconium (../zirconium/)

4 Be

Be Be

Beryllium	Béryllium
Beryllium	Beryllium
Berillio	Berilio
Beryllium	Berílio

Description

Beryllium

Key information

(../beryllium/)

List of properties (../beryllium/contents.html)

History (../beryllium/history.html)

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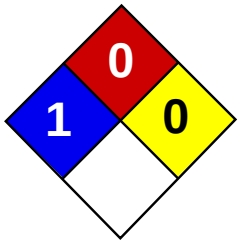

Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

pH (1% soln/water): Not applicable.

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 05/21/2013 12:00 PM

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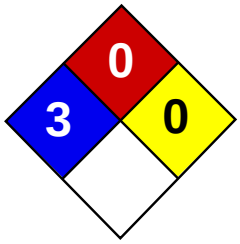

Material Safety Data Sheet
Mercury MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:
A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 0.025 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

pH (1% soln/water): Not available.

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonynickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsiliane, calcium,

Special Remarks on Corrosivity:
The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalga) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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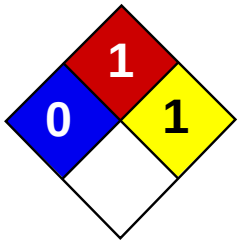

Health	1
Fire	1
Reactivity	1
Personal Protection	E

Material Safety Data Sheet
Zinc Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc Metal

Catalog Codes: SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

CAS#: 7440-66-6

RTECS: ZG8600000

TSCA: TSCA 8(b) inventory: Zinc Metal

CI#: Not applicable.

Synonym: Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

Chemical Name: Zinc Metal

Chemical Formula: Zn

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Zinc Metal	7440-66-6	100

Toxicological Data on Ingredients: Zinc Metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Zinc + NaOH causes ignition. Oxidation of zinc by potassium proceeds with incandescence. Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper. Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined. When hydrazine mononitrate is heated in contact with zinc, a flamming decomposition occurs at temperatures a little above its melting point. Contact with acids and alkali hydroxides (sodium hydroxide, postasium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas. Zinc foil ignites if traces of moisture are present. It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or moist air.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid. Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 65.39 g/mole

Color: Bluish-grey

pH (1% soln/water): Not applicable.

Boiling Point: 907°C (1664.6°F)

Melting Point: 419°C (786.2°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, moisture

Incompatibility with various substances:
Reactive with oxidizing agents, acids, alkalis. Slightly reactive to reactive with moisture. The product may react violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with acids, halogenated hydrocarbons, NH4NO3, barium oxide, Ba(NO3)2, Cadmium, CS2, chlorates, Cl2, CrO3, F2, Hydroxylamine, Pb(N3)2, MnCl2, HNO3, performic acid, KClO3, KNO3, N2O2, Selenium, NaClO3, Na2O2, Sulfur, Te, water, (NH4)2S, As2O3, CS2, CaCl2, chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide, HCl, H2SO4, (Mg +Ba(NO3)2 +BaO2), (ethyl acetoacetate +tribromoneopentyl alcohol. Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen. Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide. May react with water.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss. Eyes: May cause eye irritation. Ingestion: May be harmul if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizzness, irritability, muscular stiffness, and pain. May also affect blood. Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis. The toxicological properties of this substance have not been fully investisgated.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
New York release reporting list: Zinc Metal Rhode Island RTK hazardous substances: Zinc Metal Pennsylvania RTK: Zinc Metal Florida: Zinc Metal Michigan critical material: Zinc Metal Massachusetts RTK: Zinc Metal New Jersey: Zinc Metal California Director's List of Hazardous Substances: Zinc Metal TSCA 8(b) inventory: Zinc Metal TSCA 12(b) one time export: Zinc Metal SARA 313 toxic chemical notification and release reporting: Zinc Metal CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not Available

DSCL (EEC):
R15- Contact with water liberates extremely flammable gases. R17- Spontaneously flammable in air. S7/8- Keep container tightly closed and dry.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 1

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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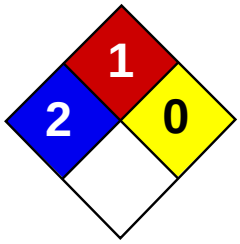
Last Updated: 05/21/2013 12:00 PM



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper

Catalog Codes: SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

CAS#: 7440-50-8

RTECS: GL5325000

TSCA: TSCA 8(b) inventory: Copper

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Cu

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper	7440-50-8	100

Toxicological Data on Ingredients: Copper LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH [1990] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 63.54 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 2595°C (4703°F)

Melting Point: 1083°C (1981.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.94 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Copper Massachusetts RTK: Copper TSCA 8(b) inventory: Copper CERCLA: Hazardous substances.: Copper

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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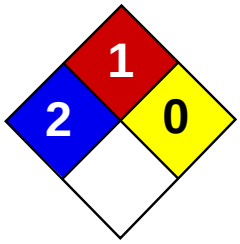

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 (mg/m3) from OSHA (PEL) [United States] TWA: 0.5 (mg/m3) from NIOSH [United States] TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

pH (1% soln/water): Not applicable.

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

Last Updated: 05/21/2013 12:00 PM

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	Books	Forum	Poll	Fun stuff	Quiz	Store
Understand your MSDS with the MS-Demystifier				Search ALL our MSDS info		

Risk Phrases (R-phrases)

Definition

The European Union (EU) requires that **risk phrases (R-phrases)** appear on each label and safety data sheet for hazardous chemicals. R-phrases consist of the letter R followed by a number. The precise meaning of each of these appears in the table below.

Labels will also have symbols or pictograms (see CHIP), but the R-phrase specifies the *particular* danger(s). For example, sodium metal may have a large F and flame icon on the label, but the particular risk is denoted by R14/15 and R34 which correspond to "Reacts violently with water liberating highly flammable gases" and "causes burns".

Safety phrases (S-phrases) for handling precautions are also part of the same requirements.

Additional Info

Both risk and safety phrases are being phased out in favor of Hazard Statements and Precautionary Statements under the EU's implementation of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) per EU Regulation (EC) 1272/2008 (6.6 MB PDF file).

More than one R-phrase may appear on an MSDS. These are usually presented in combination, such as R36/37/38. In the first table below, single phrases are given, and in the second table, combinations are given. In general, no more than four R-phrases should be sufficient to adequately communicate the risks of a particular material. The R phrases selected should be those applicable to the substance(s) present in the concentration which gives rise to the most severe classification (for example, T+ versus T).

Conversions from R-statements to H-statements can be found starting on page 1352 of EU Regulation (EC) 1272/2008.

Single Risk Phrases	
R1	Explosive when dry.
R2	Risk of explosion by shock, friction, fire or other sources of ignition.

R3	Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R4	Forms very sensitive explosive metallic compounds.
R5	Heating may cause an explosion.
R6	Explosive with or without contact with air.
R7	May cause fire.
R8	Contact with combustible material may cause fire.
R9	Explosive when mixed with combustible material.
R10	Flammable.
R11	Highly flammable.
R12	Extremely flammable.
R13	Extremely flammable liquified gas. This code is no longer in use.
R14	Reacts violently with water.
R15	Contact with water liberates highly flammable gases.
R16	Explosive when mixed with oxidizing substances.
R17	Spontaneously flammable in air.
R18	In use, may form flammable/explosive vapour-air mixture.
R19	May form explosive peroxides.
R20	Harmful by inhalation.
R21	Harmful in contact with skin.
R22	Harmful if swallowed.
R23	Toxic by inhalation.
R24	Toxic in contact with skin.
R25	Toxic if swallowed.
R26	Very toxic by inhalation.
R27	Very toxic in contact with skin.
R28	Very toxic if swallowed.
R29	Contact with water liberates toxic gases.
R30	Can become highly flammable in use.
R31	Contact with acids liberates toxic gas.
R32	Contact with acids liberates Very toxic gas.
R33	Danger of cumulative effects.
R34	Causes burns.
R35	Causes severe burns.
R36	Irritating to eyes.
R37	Irritating to respiratory system.
R38	Irritating to skin.
R39	Danger of very serious irreversible effects.
R40	Possible risks of irreversible effects.
R41	Risk of serious damage to eyes.

R42	May cause sensitization by inhalation.
R43	May cause sensitization by skin contact.
R44	Risk of explosion if heated under confinement.
R45	May cause cancer.
R46	May cause heritable genetic damage.
R47	May cause birth defects.
R48	Danger of serious damage to health by prolonged exposure.
R49	May cause cancer by inhalation.
R50	Very toxic to aquatic organisms.
R51	Toxic to aquatic organisms.
R52	Harmful to aquatic organisms.
R53	May cause long-term adverse effects in the aquatic environment.
R54	Toxic to flora.
R55	Toxic to fauna.
R56	Toxic to soil organisms.
R57	Toxic to bees.
R58	May cause long-term adverse effects in the environment.
R59	Dangerous for the ozone layer.
R60	May impair fertility.
R61	May cause harm to the unborn child.
R62	Possible risk of impaired fertility.
R63	Possible risk of harm to the unborn child.
R64	May cause harm to breastfed babies.

Multiple Risk Phrases	
R14/15	Reacts violently with water liberating highly flammable gases.
R15/29	Contact with water liberates toxic, highly flammable gas.
R20/21	Harmful by inhalation and in contact with skin.
R20/22	Harmful by inhalation and if swallowed.
R20/21/22	Harmful by inhalation, in contact with skin and if swallowed.
R21/22	Harmful in contact with skin and if swallowed.
R23/24	Toxic by inhalation and in contact with skin.
R23/25	Toxic by inhalation and if swallowed.
R23/24/25	Toxic by inhalation, in contact with skin and if swallowed.
R24/25	Toxic in contact with skin and if swallowed.
R26/27	Very toxic by inhalation and in contact with skin.
R26/28	Very toxic by inhalation and if swallowed.
R26/27/28	Very toxic by inhalation, in contact with skin and if swallowed.
R27/28	Very toxic in contact with skin and if swallowed.

R36/37	Irritating to eyes and respiratory system.
R36/38	Irritating to eyes and skin.
R36/37/38	Irritating to eyes, respiratory system and skin.
R37/38	Irritating to respiratory system and skin.
R39/23	Toxic: danger of very serious irreversible effects through inhalation.
R39/24	Toxic: danger of very serious irreversible effects in contact with skin.
R39/25	Toxic: danger of very serious irreversible effects if swallowed.
R39/23/24	Toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
R39/23/25	Toxic: danger of very serious irreversible effects through inhalation and if swallowed.
R39/24/25	Toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
R39/23/24/25	Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R39/26	Very toxic: danger of very serious irreversible effects through inhalation.
R39/27	Very toxic: danger of very serious irreversible effects in contact with skin.
R39/28	Very toxic: danger of very serious irreversible effects if swallowed.
R39/26/27	Very toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
R39/26/28	Very toxic: danger of very serious irreversible effects through inhalation and if swallowed.
R39/27/28	Very toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
R39/26/27/28	Very toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R40/20	Harmful: possible risk of irreversible effects through inhalation.
R40/21	Harmful: possible risk of irreversible effects in contact with skin.
R40/22	Harmful: possible risk of irreversible effects if swallowed.
R40/20/21	Harmful: possible risk of irreversible effects through inhalation and in contact with skin.
R40/20/22	Harmful: possible risk of irreversible effects through inhalation and if swallowed.
R40/21/22	Harmful: possible risk of irreversible effects in contact with skin and if swallowed.
R40/20/21/22	Harmful: possible risk of irreversible effects through inhalation, in contact with skin and if swallowed.
R42/43	May cause sensitization by inhalation and skin contact.
R48/20	Harmful: danger of serious damage to health by prolonged exposure through inhalation.
R48/21	Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
R48/22	Harmful: danger of serious damage to health by prolonged exposure if swallowed.

R48/20/21	Harmful: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R48/20/22	Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R48/21/22	Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R48/20/21/22	Harmful: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R48/24	Toxic: danger of serious damage to health by prolonged exposure in contact with skin.
R48/25	Toxic: danger of serious damage to health by prolonged exposure if swallowed.
R48/23/24	Toxic: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R48/23/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R48/24/25	Toxic: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R48/23/24/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R51/53	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R52/53	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

MSDS Relevance

Risk phrases are not required on labels or MSDS's by U.S. OSHA, however, they are required in the European Community. Therefore, you may see these R phrases on your sheets, especially as manufacturers start following internationally-accepted formats such as the ANSI system. Or you may start seeing H-statements instead of risk phrases as the GHS is phased in.

Remember that risk phrases indicate only the risk of a material, not the safety precautions that you need to follow. For safety information see the safety phrases entry.

Gas cylinder tags and all kind of workplace accessories are available at Safety Emporium

Further Reading

- The Basics of Chemical Safety at the International Occupational Safety and Health Information Centre (CIS) discusses R- and S-phrases, and includes a list of chemicals.
- A R- and S-phrases language conversion tool in 23 languages at SchoolScout24.
- Council Directive 2006/102/EC (PDF file) contains R- and S-phrases as well as other hazard terms in 23 languages.

- The Provisions for Classifying Dangerous Preparations (see Schedule 3) discusses how risks and risk phrases are quantified.

See also: ANSI, CHIP, EINECS, Hazard Statements, safety phrases and the International Section of the MSDS FAQ.

Additional definitions from Google and OneLook.

Abbreviations from Instant Tox-Base

ACGIH - American Conference of Governmental Industrial Hygeniests

AChE - acetylcholinesterase

Action Level - the exposure concentration at which certain provisions of the NIOSH recommended standard must be initiated.

ADI - acceptable daily intake

AIHA - American Industrial Hygiene Associaton

ASTM - American Society for Testing and Materials

brd - domestic or laboratory bird

Bw - body weight

bwd - wild bird species

Ca- potential human carcinogen

CAS - Chemical Abstract Service

CASRN - Chemical Abstract Service Registery Number

cat - adult cat

cc - cubic centimeter

CCINFO - Canadian Centre for Occupational Health and Safety, Toronto, Canada

CDC - Center for Disease Control (in Atlanta, Georgia)

CFR - Code of Federal Regulations

chd - child

Che - cholinesterase

CIB - NIOSH Current Intelligence Bulletin

CIS - Fein-Marquardt and Co., Chemical Information System

ckn - chicken, adult (male or female)

CL - ceiling limit - the concentration that should not be exceeded even instantaneously.

Clear Evidence - when carcinogenicity is demonstrated by studies that are interpreted as showing a chemically related increased incidence of malignant neoplasms, studies that exhibit a substantially increased incidence of benign neoplasms, or studies that exhibit an increased incidence of a combination of malignant and benign neoplasms where each increases with dose.

CODEN - a unique six-letter character code derived from the American Society for Testing and Materials CODEN for Periodical Titles and the CAS Source Index.

ctl - cattle or horse

dBA - decibel, weighted according to the A scale, which approximates the response of the human ear.

dck - duck

DEA - US Drug Enforcement Administration

dog - adult dog

dom - domestic animals such as goat or sheep

DOT - US Department of Transportation

ECG - electrocardiogram

EPA -- US Environmental Protection Agency

Equivocal Evidence - when carcinogenicity is demonstrated by studies that are interpreted as showing a chemically related marginal increase of neoplasms.

fbr - fiber

FR - Federal Register

frg - adult frog

GC - gas chromatography (a technique used to separate mixtures of volatile chemicals from each other)

GI - gastrointestional

gpg - guinea pig

grb - gerbil

ham - hamster

HDT - highest dose tested

HEC - human equivalent concentration

hmn - human

hor - horse or donkey

HPLC - high performance liquid chromatography (a technique used to separate mixtures of nonvolatile chemicals from each other)

HSDB - Hazardous Substances Data Bank

ial - intraaural (ear)

IARC - United Nations International Agency for Research on Cancer.

iat - intraarterial (artery)

ice - intracerebral (cerebrum)

ICR - Institute of Cancer Research

icv - intracervical (cervix)

idr - intradermal (dermis (skin))

idu - intraduodenal (duodenum)

ihl - inhalation (route of exposure used for a chemical)

IMO - International Maritime Organization

imp - surgical implant

ims - intramuscular (muscle)

Inadequate Evidence - when, because of major qualitative or quantitative limitatons, the studies cannot be interpreted as showing eiher the presence or absence of a carcinogenic effect. This indicates that one of two conditions prevailed: (a) there are few pertinent data; or (b) the available studies, while showing evidence of association, do not exclude chance, bias, or confounding.

Inadequate Study - when carcinogenicity is not demonstrated because of major qualitative or quantitative limitations, and the studies cannot be interpreted as valid for showing either the presence or absence of a carcinogenic effect.

inf - human infant

ipc - intraplacental (placenta)

ipl - intrapleural (pleural cavity)

ipr - intraperitoneal (peritoneal cavity)

IRIS - Integrated Risk Information System (Instant EPAs IRIS is one of the publications from Instant Reference Sources, Inc. that is hyperlinked to this publication)

irn - intrarenal (kidney)

isp - intraspinal (spinal canal)

itr - intratracheal (trachea)

itt - intratesticular (testes)

iut - intrauterine (uterus)

ivg - intravaginal (vagina)

ivn - intravenous (vein)

kdy - kidney

kg - killigram (one thousand grams)

L - liter (one thousand milliliters)

LC - lethal concentration

LC50 - Lethal Concentration 50 - a calculated concentration of a substance in air, exposure to which for a specified length of time, is expected to cause the death of 50% of an entire defined experimental population. It is determined from the exposure to the substance of a significant number from that population.

LCLo - Lethal Concentration Low - the lowest concentration of a substance in air, other than LC50, which has been reported to have caused death in humans or animals. The reported concentrations may be entered for periods of exposure which are less than 24 hours (acute) or greater than 24 hours (subacute and chronic).

LD - lethal dose

LD50 - Lethal Dose 50 - a calculated dose of a substance which is expected to cause the death of 50% of an experimental animal population. It is determined from the exposure to the substance by any route other than inhalation of a significant number from that population.

LDLo - Lethal Dose Low - the lowest dose (lower than LD50) of a substance introduced by any route, other than inhalation, over any given period of time, in one or more divided portions and reported to have caused death in humans or animals.

LDT - lowest dose tested

leu - leukemia

Limited Evidence - evidence of carcinogenicity when data suggest a carcinogenic effect but are limited because: (a) the studies involve a single species, strain or experiment; or (b) the experiments are restricted by inadequate dosage levels, inadequate duration of exposure to the agent, inadequate duration of exposure to the agent, inadequate period of follow-up, poor survival, too few animals, or inadequate reporting; or (c) the neoplasms produced often occur spontaneously and, in the past, have been difficult to classify as malignant by histological criteria alone. This indicates that a causal interpretation is credible, but that alternative explanations, such as chance, bias, or confounding, could not adequately be excluded.

LOAEL - lowest observed adverse effect level

lym - lymphatic (pertaining to lymph glands, cells or the lymphatic system)

mam - mammal of an unidentified species

man - adult man

MEV - minimum effective dose

mg - milligram

mky - monkey

MLD - mild - a well defined erythema and slight edema on the skin where the dose was applied.

mmol - millimole

MOD - moderate - moderate to severe erythema and severe edema on the skin where the dose was applied resulting in a raised area of about 1 mm.

MOE - margin of exposure

MSHA - Mine Safety and Health Administration

MTD - maximum tolerated dose

MTL - median threshold limit

mul - multiple

mus - mouse

NCI - National Cancer Institute

ng - nanogram

NIH - National Institues of Health

NIOSH - National Institute of Occupational Safety and Health

NLM - National Library of Medicine

nml - non-mammalian species

nmol - nanomole

No Evidence - when several adequate studies are available which show that, within the limits of the tests used, the chemical is not carcinogenic.

NOEL - no observed effect level

NRC - National Research Council

nse - non-standard exposure (for example, a spill or accidental exposure)

NTIS - National Technical Informational System

NTP - National Toxicology Program

ocu - ocular (eye)

ORD - US EPA Office of Research and Development

orl - oral (through the mouth via feeding or drinking)

oth - other (?)

otr - other (?)

OTS - US EPA Office of Toxic Substances

par - parenteral (skin)

PCB - polychlorinated biphenyls

PEL - OSHA permissible exposure level

pg - picogram

pgn - pigeon

pig - adult pig

pmol - picomole

ppb - parts per billion

pph - parts per hundred

ppm - parts per million

ppt - parts per trillion

qal - laboratory quail

rat - adult male, adult female or unspecifided sex of rat

rbt - adult rabbit

rec - rectal (rectum or colon)

REL - NIOSH recommended exposure limi

rns - rinsed

RTECS - Registry of Toxic Effects of Chemical Substances

RV - residual volume

sat - saturated

scu - subcutaneous (under the skin)

SEV - severe - severe erythema (beet redness) to slight eschar formation (injuries in depth) and severe edema (raised more than 1 mm and extending beyond area of exposure) on the skin where the dose was applied.

(skin) - potential contribution to overall exposure by the cutaneous route including mucous membranes and eyes.

skn - skin

SMR - standard mortality rate

Some Evidence - when carcinogenicity is demonstrated by studies that are interpreted as showing a chemically related increased incidence of benign neoplasms, studies that exhibit marginal increases in neoplasms of several organs/tissues, or studies that exhibit a slight increase in uncommon malignant or benign neoplasms.

specie - species of animal tested (e.g., rat, rabbit, human, etc.)

sql - squirrel

STEL - short term exposure limit

Sufficient Evidence - evidence of carcinogenicity when there is an increased incidence of malignant tumors: (a) in multiple species or strains; or (b) in multiple experiments (preferably with different routes of administration or using different dose levels); or (c) to an unusual degree with regard to incidence, site or type of tumor, or age at onset. Additional evidence may be provided by data on dose-response effects. This indicates that there is a causal relationship between the exposure and human cancer.

TC - toxic concentration

TCLo - Toxic Concentration Low - the lowest concentration of substance in air to which humans or animals have been exposed for any given period of time, that has produced any toxic effect in humans, or has produced a tumorigenic or reproductive effect in animals or humans.

TD - toxic dose

TDLo - Toxic Dose Low - the lowest dose of a substance introduced by any route other than inhalation, over any given period of time, to which humans or animals have been exposed and reported to produce any non-significant toxic effects in humans or to produce non-significant tumorigenic or reproductive effects in animals or humans.

TEC - Toxic Effects Code

TLV - Threshold Limit Values - recommended limits proposed by the American Conference of Governmental Industrial Hygienists (ACGIH) to which most workers can be exposed wihout adverse effect. TLVs may be expressed as a time-weighted average (TWA), as a short term exposure limit (STEL), or as a ceiling value (CL).

tod - toad

TOXNET - Toxicology Data Network

trk - turkey

TSCA - Toxic Substances Control Act

TSCATS - Toxic Substance Control Act Test Submission

TWA - time-weighted average

ug - microgram

umol - micromole

unr - unreported

WHO - United Nations World Health Organization.

wmn - woman

Appendix C

Heat Stress and Cold Stress Guidelines

Heat Stress Guidelines

Form	Signs & Symptoms	Care	Prevention[3]
Heat Rash	Tiny red vesicles in affected skin area. If the area is extensive, sweating can be impaired.	Apply mild lotions and cleanse the affected area.	Cool resting and sleeping areas to permit skin to dry between heat exposures.
Heat Cramps	Spasm, muscular pain (cramps) in stomach area and extremities (arms and legs).	Provide replacement fluids with minerals (salt) such as Gatorade.	Adequate salt intake with meals[1]. ACCLIMATIZATION[2]
Heat Exhaustion	Profuse sweating, cool (clammy) moist skin, dizziness, confusion, pale skin color, faint, rapid shallow breathing, headache, weakness, and/or muscle cramps.	Remove from heat, sit or lie down, rest, replace lost water with electrolyte replacement fluids (water, Gatorade) take frequent sips of liquids in amounts greater than required to satisfy thirst.	ACCLIMATIZATION[2] Adequate salt intake with meals[1], only during early part of heat season. Ample water intake, frequently during the day.
Heat Stroke	HOT Dry Skin. Sweating has stopped. Mental confusion, dizziness, nausea, chills, severe headache, collapse, delirium, and/or coma.	HEAT STROKE IS A MEDICAL EMERGENCY • Remove from heat. • COOL THE BODY AS RAPIDLY AS POSSIBLE by immersing in cold (or cool) water, or splash with water and fan. • Call for Emergency Assistance. • Observe for signs of shock.	ACCLIMATIZATION[2] Initially moderate workload in heat (8 to 14 days). Monitor worker's activities.

Footnotes:

1.) American diets are normally high in salt, sufficient to aid acclimatization. However, during the early part of the heat season, (May, June), one extra shake of salt during one to two meals per day may help, so long as this is permitted by your physician. Check with your personal physician.

2.) ACCLIMATIZATION - The process of adapting to heat is indicated by worker's ability to perform hot jobs less fluid loss, lower concentrations of salt loss in sweat, and a reduced core (body) temperature and heart rate.

3.) Method to Achieve Acclimatization - Moderate work or exercise in hot temperatures during early part of heat season. Adequate salt (mineral) and water intake. Gradually increasing work time in hot temperatures. Avoid alcohol. Normally takes 8 to 14 days to achieve acclimatization. Lost rapidly, if removed from strenuous work (or exercise) in hot temperature for more than approximately 5 days.

Cold Stress Guidelines

Stress	Symptoms	What to do
Mild Hypothermia	• Body Temp 98 to 90°F • Shivering • Lack of coordination, stumbling, fumbling hands • Slurred speech • Memory loss • Pale, cold skin	• Move to warm area • Stay active • Remove wet clothes and replace with dry clothes or blankets • Cover the head • Drink warm (not hot) sugary drink
Moderate Hypothermia	• Body temp 90 to 86°F • Shivering stops • Unable to walk or stand • Confused and/or irrational	• All of the above, plus: o Call 911 o Cover all extremities completely o Place very warm objects, such as hot packs on the victim's head, neck, chest, and groin
Severe Hypothermia	• Body temp 86 to 78°F • Severe muscle stiffness • Very sleepy or unconscious • Ice cold skin • Death	• Call 911 • Treat victim very gently • Do not attempt to re-warm
Frostbite	• Cold, tingling, stinging, or aching feeling in the frostbitten area, followed by numbness • Skin color turns red, then purple, then white or very pale skin • Cold to the touch • Blisters in severe cases	• Call 911 • Do not rub the area • Wrap in soft cloth • If help is delayed, immerse in warm (not hot) water
Trench Foot	• Tingling, itching, or burning sensation • Blisters	• Soak feet in warm water, then wrap with dry cloth bandages • Drink a warm (not hot) sugary drink

Appendix D

Forms

GEI Consultants

Accident/Incident Report Form

Please complete this form and send it to your Branch Manager, HR and CHSO ***within 24 hours*** of the incident.

SECTION A — ACCIDENT/INCIDENT DETAILS

EMPLOYEE INFORMATION:

Name: _____

Home Address: _____
Street Address City State Zip Code

Contact Information: ( ) ( )
Primary Secondary

Date of Birth: _____

Date of Hire: _____

Branch: _____

Supervisor: _____

OTHER INJURED (IF APPLICABLE):

Name: _____

Home Address: _____
Street Address City State Zip Code

Contact Information: ( ) ( )
Primary Secondary

Date of Birth: _____

Date of Hire: _____

Branch: _____

Supervisor: _____

Date and Time Accident/Incident	Date and Time Reported
____ /____ /____ Month Day Year	____ /____ /____ Month Day Year
____ A.M. ____ P.M.	____ A.M. ____ P.M.

LOCATION OF INCIDENT/ACCIDENT

Project Name: _____

Client and Location: _____

or _____

Office Location: _____

INCIDENT TYPE: (Check All That Applies)

- ☐ **Personal Injury/Illness**
- ☐ **Vehicle Accident**
- ☐ **Property Damage**
- ☐ **Environmental Spill**
- ☐ **Other**

WITNESS INFORMATION

Name: _____

Contact Number: _____

Company: _____

WHAT HAPPENED TO THE INJURED PARTY: ☐ First Aid Administered ☐ Refused Treatment/Transport ☐ Transported to Hospital ☐ Returned to Work ☐ Went Home ☐ Went to Physician ☐ Unknown

Clinic/Hospital or Treating Physician: _____ Phone: _____
Name Street Address City State Zip Code

SECTION B — PERSONAL INJURY

Cause of Injury: _____

Part of Body Injured: _____ Multiple Injuries: ☐ Y ☐ N

Was PPE worn when injured? : ☐ Y ☐ N What PPE was worn? _____

WAS INJURY A RESULT OF THE USE A MOTOR VEHICLE: ☐ **YES** ☐ **NO** **(If yes, complete Section C)**

GEI Consultants

Accident/Incident Report Form

Please complete this form and send it to your Branch Manager, HR and CHSO ***within 24 hours*** of the incident.

SECTION C — AUTO ACCIDENT ONLY

DRIVER/VEHICLE INFORMATION

Name of Insured: _____

Department: _____

Driver's License Number: _____

DOB: ____/____/____ State: _____

Description of Vehicle: License Plate Number: _____

Make: _____ Model: _____ Year:_____ Color:_____

Owner: _____

Name of Other Driver: _____

Driver's License Number: _____

State: _____

Description of Vehicle: License Plate Number: _____

Make: _____ Model:_____ Year:_____ Color:_____

Insurance Carrier: _____

Policy Number: _____Ph. Number:_____

SECTION D — PROPERTY DAMAGE OR CHEMICAL RELEASE ONLY

Type of Damage(s): _____

Cause of Damage(s): _____

Type of Chemical Released (if known): _____

Quantity of Chemical Released: _____

Spill Measures Employed: _____

SECTION E — NATURE OF ACCIDENT/INCIDENT AND EXTENT OF INJURIES/DAMAGES

(Please give a detailed description of what happened. Attach a sketch or picture if applicable)

_____

_____

_____

_____

_____

_____

_____

_____

_____

I hereby certify that the above information is true and correct to my understanding of this accident/incident.

_____ _____

Employee/Preparer's Name **Date and Time**

GEI Consultants

Near Miss Report Form

Please complete this form and send it to your Branch Manager, HR and the Safety Team ***within 24 hours*** of the near miss.

NEAR MISS DETAILS

Employee Name: _____

Phone Number: _____

Branch: _____

Supervisor: _____

Date and Time Accident/Incident	Date and Time Reported	LOCATION OF NEAR MISS
____/____/____ Month Day Year ____A.M. ____P.M.	____/____/____ Month Day Year ____A.M. ____P.M.	**Project Name:** _____ **Client and Location:** _____ **or** _____ **Office Location:** _____

WHAT HAPPENED?

(Please give a detailed description of what happened. Attach photos or a sketch, if applicable.)

_____

_____

_____

_____

_____

☐ **Photos were Taken**

WHAT WAS DONE?

(Please give a detailed description of what was done to prevent and incident from occurring.)

_____

_____

_____

_____

_____

_____

☐ **I have verbally contacted a member of the Safety Team and my Supervisor.**

_____ _____

Employee/Preparer's Name **Date and Time**

Project Safety Briefing Form

Project Number:	**Project Name:**
Date:	**Time:**
Briefing Conducted by:	**Signature:**

This sign-in log documents that a project specific-briefing was conducted in accordance with the site-specific HASP and GEI's H&S policy. GEI personnel who perform work on site are required to attend this project briefing. Applicable health and safety SOPs and any additional hazards are also required to be reviewed during this briefing. Prior to the start of the project or upon the start of a new on-site project team member, this form must be completed. Please email this completed form to:

SafetyTeam@geiconsultants.com

TOPICS COVERED (check all those covered):

SOP HS-001 Biological Hazards		SOP HS-025 Manual Lifting	
SOP HS-002 Bloodborne Pathogens		SOP HS -26 Hazard Identification	
SOP HS-003 Container Management		SOP HS-27 Confined Space Entry for Sanitary Sewers	
SOP HS-004 Driver Safety		SOP HS-28 Safe Trailer Use	
SOP HS-005a Electrical Safety		SOP HS-29 Overtime and Fatigue Management	
SOP HS-005b Lockout/Tagout		Accident Reporting Procedures	
SOP HS-006 Excavation/Trenching		Changes to the HASP	
SOP HS-008a Hand Tools (Non-Powered)		Cold Stress	
SOP HS-008b Powered Hand Tools		Confined Space	
SOP HS-009 Hazardous Substances Management		Decon Procedures	
SOP HS-010 Inclement Weather		Exposure Guidelines	
SOP HS-011 Ladders		General PPE Usage	
SOP HS-012 Noise Exposure		Heat Stress	
SOP HS-013 Nuclear Density Gauge		Hearing Conservation	
SOP HS-014 Utility Markout		Lockout/Tagout	
SOP HS-015 Respirator Fit Test		Personal Hygiene	
SOP HS-016 Traffic Hazards		Respiratory Protection	
SOP HS-017 Water Safety		Review of Hazard Evaluation	
SOP HS-018 Working Around Heavy Equipment		Site Control	
SOP HS-019 Rail Safety		Site Emergency Procedures	
SOP HS-020 Aerial Lift		Slips, Trips, Falls	
SOP HS-021 Mobile Equipment		Other (Specify):	
SOP HS-022 Aquatic Ecological Survey/Electrofishing		Other (Specify):	
SOP HS-023 Scaffolding		Other (Specify):	
SOP HS-024 Wilderness Safety		Other (Specify):	

Personnel Sign-in List

Printed Name	**Signature**

Daily Safety Briefing and Site Visitor Sign-In

Project Number:	**Project Name:**
[1]Date:	**Time:**
Briefing Conducted by:	**Signature:**

This sign-in log documents the tailgate briefing conducted in accordance with the site specific HASP. Personnel who perform work operations on site are required to attend each briefing and to acknowledge receipt of each briefing, daily.

TOPICS COVERED (check all those covered):

☐ Accident Reporting Procedures	☐ Heat Stress	☐ Site Emergency Procedures	☐ Other:
☐ Changes to the HASP	☐ Hearing Conservation	☐ Slips, Trips, Falls	☐ Other:
☐ Cold Stress	☐ Lockout/Tagout	☐ Traffic Safety	☐ Other:
☐ Confined Space	☐ Personal Hygiene	☐ Other:	☐ Other:
☐ Decon Procedures	☐ Respiratory Protection	☐ Other:	☐ Other:
☐ Exposure Guidelines	☐ Review of Hazards	☐ Other:	☐ Other:
☐ General PPE Usage	☐ Site Control	☐ Other:	☐ Other:

Daily Safety Topic Description:

Personnel Sign-in List

Printed Name	Signature	Company Name	Time-In	Time-Out

[1] This form is applicable for *only* 1 day of site activity.

Appendix E

GEI's Health and Safety SOPs

Applicable GEI H&S SOPs *(check all that apply)*					
☒ Biological Hazards – 001		☐ Ladders -011		☐ Mobile Equipment – 021
☒ Bloodborne Pathogens – 002		☒ Noise Exposure -012		☐ Aquatic Ecological Survey & Electrofishing -022
☐ Container Management – 003		☐ Nuclear Density Gauge Operation -013		☐ Scaffolding - 023
☒ Driver Safety -004		☐ Utility Markout-014		☐ Wilderness Safety - 024
☐ Electrical Safety Lock Out Tag Out -005		☐ Respirator Fit Test Procedure-015		☒ Manual Lifting – 025
☒ Excavation Trenching - 006		☒ Traffic Hazards -016		☒ Hazard Identification - 026
☒ Non-Powered Hand Tools -008a		☐ Water Safety – 017		☐ Confined Space Entry for Sanitary Sewers – 027
☐ Powered Hand Tools – 008b		☐ Working Around Heavy Equipment – 018		☐ Safe Trailer Use – 028
☒ Hazardous Substances Management -009		☐ Rail Safety -019		☒ COVID-19 Field Work Guidance
☒ Inclement Weather – 010		☐ Aerial Lift – 020		

STANDARD OPERATING PROCEDURES

SOP No. HS-001 Biological Hazards

1.1 Objective

The objective of this Standard Operating Procedure (SOP) is to prevent or limit the potential for GEI personnel to encounter biological hazards during field activities.

1.2 General

This SOP is intended for use by employees engaged in work with the potential for contact with biological hazards such as animals, insects, plants, and sewage. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for encounters with biological hazards and the control methods to be implemented by GEI employees. These hazards must be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Safety page of the GEI intranet.

1.3 Mammals

During some site operations, animals such as stray or domesticated dogs or cats, raccoons, snakes, bears, rats, bats, etc. may be encountered. Employees should use discretion and attempt to avoid contact with animals. If these animals present a problem, efforts will be made to remove these animals from the site by contacting a licensed animal control technician.

1.3.1 Rabies

The rabies virus is transmitted through the bite of an infected animal or contact with saliva or brain/nervous system tissue of an infected animal. The rabies virus infects the central nervous system, causing disease in the brain. The early symptoms of rabies in people are fever, headache, and general weakness or discomfort. As the disease progresses, more specific symptoms appear and may include insomnia, anxiety, confusion, slight or partial paralysis, excitation, hallucinations, agitation, hypersalivation (increase in saliva), difficulty swallowing, and hydrophobia (fear of water). Death usually occurs within days of the onset of these symptoms.

If you are bitten or think you may be exposed, wash any wounds immediately and thoroughly with soap and water. Then go to the hospital emergency room and notify the Project Manager and the People Safety Team. The doctor, possibly in consultation with the state or local health department, will decide if you need a rabies vaccination. Decisions to start series of vaccinations will be based on your type of exposure and the animal you were exposed to, as well as laboratory and surveillance information for the geographic area where the exposure occurred. If possible have someone document what type of animal it was, how it was behaving prior to the bite, what caused it to bite the

employee, and if it's not a domestic animal that would be easy to find again in the future, try to get animal control on site to capture it. An Incident Report Form must be completed and submitted, per GEI's Incident reporting procedures. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

1.4 Insects and Arachnids

Insects, including bees, wasps, hornets, mosquitoes, ticks, spiders, etc., may be present at a job site making the chance of a bite/sting possible. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life-threatening condition. Some insect bites can transmit diseases such as Lyme disease or a virus such as West Nile. The following is a list of preventive measures:

- Apply insect repellent prior to performing field work and as often as needed throughout the work shift.
- Wear proper personal protective equipment (PPE), including protective clothing (work boots, socks, and light colored clothing).
- Wear shoes, long pants with bottoms tucked into boots or socks, and a long-sleeved shirt when outdoors for long periods of time, or when many insects are most active (between dawn and dusk).
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible.
- Field personnel who have or may have insect allergies must have insect allergy medication onsite and must inform the Site Safety Officer (SSO) and the People and Safety Team of their particular allergy prior to commencing work.
- Field personnel should perform a self-check at the end of the day for ticks.

1.4.1 Tick-borne Diseases

Lyme Disease

Lyme disease is caused by infection from a deer tick that carries a spirochete (a bacterium). During the painless tick bite, the spirochete may be transmitted into the bloodstream, often after feeding on the host for 12 to 24 hours. The ticks that cause the disease are often no bigger than a poppy seed or a comma in newsprint. The peak months for human infection are from May to September.

Symptoms appear in three stages. First symptoms usually appear from 2 days to a few weeks after a person is bitten by an infected tick. Symptoms usually consist of a ring-like red rash on the skin where the tick was attached. The rash is often bulls-eye like with red around the edges and clear in the center. The rash may be warm, itchy, tender, and/or "doughy." This rash appears in only 60 to 80 percent of infected persons. An infected

person also has flu-like symptoms of a stiff neck, chills, fever, sore throat, headache, fatigue, and joint pain. These symptoms often disappear after a few weeks.

The second stage symptoms, which occur weeks to months later include meningitis, severe headache, drooping of the muscles on the face, called Bell's Palsy, encephalitis, numbness, withdrawal, and lethargy. These symptoms may last for several weeks to several months. Third stage symptoms, which occur months or years later include arthritis, heart problems, and loss of memory. The third stage symptoms may mimic multiple sclerosis and Alzheimer's disease.

When in areas that could harbor deer ticks, employees should wear light color clothing, and visually check themselves and check and be checked by another employee when coming from wooded or vegetated areas. If a GEI employee has a tick bite, the People and Safety Team and Project Manager must be contacted immediately. The employee will be offered the option for medical treatment by a physician, which typically involves antibiotics. An Incident Report form must be completed in compliance with the Incident Reporting procedures. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

If personnel feel sick or have signs similar to those mentioned above, the SSO and the People and Safety Team must be notified immediately.

Figure 1: From left to right, the deer tick adult female, adult male, nymph, and larva on a centimeter scale.

How to Remove a Tick

A tick can be removed from the skin by pulling gently at the head with tweezers. If tweezers are not available, use tissue paper or cloth to grasp the tick. It is important to grasp the tick as close to the site of attachment and use a firm steady pull to remove it. Wash hands immediately after with soap and water. The affected area should also be washed with soap and water, then disinfected with an antiseptic wipe, if available. All mouth parts must be removed from the skin. If the tick was removed by breaking off the

mouth parts, an irritation or infection may occur because the organism that is causing the disease can still enter the body through the skin.

Treatment for Lyme Disease

Treatment with antibiotics is effective and recovery is usually complete. For first stage symptoms, antibiotics are usually given orally. However, treatment for second and third stage symptoms is prolonged and recovery may take longer. Antibiotic treatment is usually provided intravenously for second and third stage Lyme disease.

Babesiosis

The deer tick can also cause Babesiosis, an infection of the parasite Babesia Microti. Symptoms of Baesiosis may not be evident, but may also include fever, fatigue and hemolytic anemia lasting from several days to several months. Babesiosis is most commonly diagnosed in the elderly or in individuals whose immune systems are compromised. If there are no signs or symptoms of Babesiosis, usually no treatment it needed. If an employee believes they might have Babesiosis they'll see a physician to be tested. Treatment usually consists of taking prescription medications for 7 to 10 days.

Ehrlichiosis

Ehrlichiosis is a tick-borne disease which can be caused by either of two different organisms. Human monocytic ehrlichiosis (HME) is caused by *Ehrlichia chaffeensis*, which is transmitted by the lone star tick (*Amblyomma americanum*). Human granulocytic anaplasmosis (HGA), previously known as human granulocytic ehrlichiosis (HGE), is caused by *Anaplasma phagocytophilia*, which is transmitted by the deer tick (*Ixodes scapularis*).

Ehrlichiosis is transmitted by the bite of infected ticks, including the deer tick and the lone star tick. The symptoms of HME and HGE are the same and usually include fever, muscle aches, weakness and headache. Patients may also experience confusion, nausea, vomiting and joint pain. Unlike Lyme disease or Rocky Mountain spotted fever, a rash is not common. Infection usually produces mild to moderately severe illness, with high fever and headache, but may occasionally be life-threatening or even fatal. Symptoms appear 1 to 3 weeks after the bite of an infected tick. However, not every exposure results in infection. For those that become infected a drug called Doxcycline will be prescribed.

Rocky Mountain Spotted Fever

Rocky Mountain spotted fever is a tick-borne disease caused by a rickettsia (a microbe that differs somewhat from bacteria and virus). In the eastern United States, children are infected most frequently, while in the western United States, disease incidence is highest among adult males. Disease incidence is directly related to exposure to tick-infested habitats or to infested pets. Rocky Mountain spotted fever is characterized by a sudden onset of moderate to high fever (which can last for 2-3 weeks), severe headache, fatigue, deep muscle pain, chills and rash. The rash begins on the legs or arms, may include the

soles of the feet or palms of the hands and may spread rapidly to the trunk or rest of the body. Symptoms usually appear within 2 weeks of the bite of an infected tick. Like Ehrlichiosis the prescription drug Doxcycline is the first line treatment option.

1.4.2 Mosquito-Borne Disease

West Nile Virus
West Nile Virus is a mosquito-borne infection transmitted through the bite of an infected mosquito. The symptoms of West Nile Virus can be asymptomatic (no symptoms) or in more serious cases can lead to West Nile Fever. West Nile Fever can include fever, headache, tiredness, body ache, an occasional rash on the trunk of the body, and swollen lymph glands, In severe cases, people have developed West Nile Encephalitis or Meningitis which symptoms include fever, headache, neck stiffness, tremors, coma, and in some cases death. The incubation period for the disease is usually 2 to 15 days. The symptoms can range from a few days to several weeks. Most mosquitoes are not infected and the chance of infection from a mosquito bite of an on-site employee is very small.

1.5 Repellants

The following precautions will be used to help reduce the risk of mosquito bites:

Reduce mosquito-breeding areas by making sure wheelbarrows, buckets, and other containers are turned upside down when not used so that they do not collect standing water. According to the Environmental Protection Agency (EPA), many mosquitoes can breed in pooled water that's minimal enough to fill a bottle cap.

Wear shoes, long pants with bottoms tucked into boots or socks, and a long-sleeved shirt when outdoors for long periods of time, or when many mosquitoes are most active (between dawn and dusk).

Use mosquito repellant according to the manufacturer's directions when outdoors for long periods of time and when mosquitoes are most active.

Centers for Disease Control and Prevention (CDC) evaluation of information contained in peer-reviewed scientific literature and data available from the EPA has identified several EPA-registered products that provide repellent activity sufficient to help people avoid the bites of disease carrying mosquitoes. Products containing these active ingredients typically provide reasonably long-lasting protection:

- **DEET** (Chemical Name: N,N-diethyl-m-toluamide or N,N-diethly-3-methyl-benzamide)
- **Picaridin** (KBR 3023, Chemical Name: 2-(2-hydroxyethyl)-1-piperidinecarboxylic acid 1-methylpropyl ester)

- **Oil of Lemon Eucalyptus** or **PMD** (Chemical Name: para-Menthane-3,8-diol) the synthesized version of oil of lemon eucalyptus
- **IR3535** (Chemical Name: 3-[N-Butyl-N-acetyl]-aminopropionic acid, ethyl ester)
- **Permethrin** (3-Phenoxybenzyl (1RS)-cis,trans-3-(2,2-dichlorovinyl) -2,2-dimethylcyclopropanecarboxylate) – Permethrin kills ticks and can be used on clothing (but not skin)

The EPA characterizes the active ingredients DEET and Picaridin as "conventional repellents" and Oil of Lemon Eucalyptus, PMD, and IR3535 as "biopesticide repellents", which are derived from natural materials.

In general, higher concentrations of active ingredient provide longer duration of protection, regardless of the active ingredient, although concentrations above approximately 50 percent do not offer a marked increase in protection time. Products with less than 10 percent active ingredient may offer only limited protection, often from 1 to 2 hours. Products that offer sustained release or controlled release (micro-encapsulated) formulations, even with lower active ingredient concentrations, may provide longer protection times. Regardless of what product you use, if you start to get mosquito bites reapply the repellent according to the label instructions or remove yourself from the area with biting insects if possible.

Clothing and other products can be purchased pre-treated, or products can be treated using EPA-registered products. Permethrin is the only pesticide approved by the EPA for these uses. Permethrin binds tightly to the fabrics, resulting in little loss during washing and minimal transfer to the skin. Permethrin is poorly absorbed through the skin, although sunscreens and other products may increase the rate of skin absorption.

If you decide to use permethrin-treated clothing, consider these tips:

- Read the application instructions carefully and apply the product according to the label directions. Do not over-treat products.
- Permethrin treatments are only intended for use on fabrics; do not apply them directly to the skin or other items.
- Do not apply permethrin to clothing while it is being worn.
- Apply the product to clothing outdoors in well ventilated areas that are protected from wind.
- Hang treated fabrics outdoors and allow them to dry completely before wearing them.
- Wash permethrin treated clothing separately from other clothing items.

1.6 Poisonous Plants

The potential for contact with poisonous plants, such as poison ivy, oak, and sumac exists when performing fieldwork in wooded or boggy areas. Urushiol, an oily organic allergen found in plants, can cause an allergic reaction when in contact with the leaves or vines.

Poison ivy can be found as vines on tree trunks or as upright bushes. Poison ivy consists of three leaflets with notched edges. Two leaflets form a pair on opposite sides of the stalk, and the third leaflet stands by itself at the tip. Poison ivy is red in the early spring and turns shiny green later in the spring. Poison ivy grows throughout much of North America, including all states east of the Rocky Mountains. It is normally found in wooded areas, especially along edge areas where the tree line breaks and allows sunshine to filter through. It also grows in exposed rocky areas, open fields, and disturbed areas.

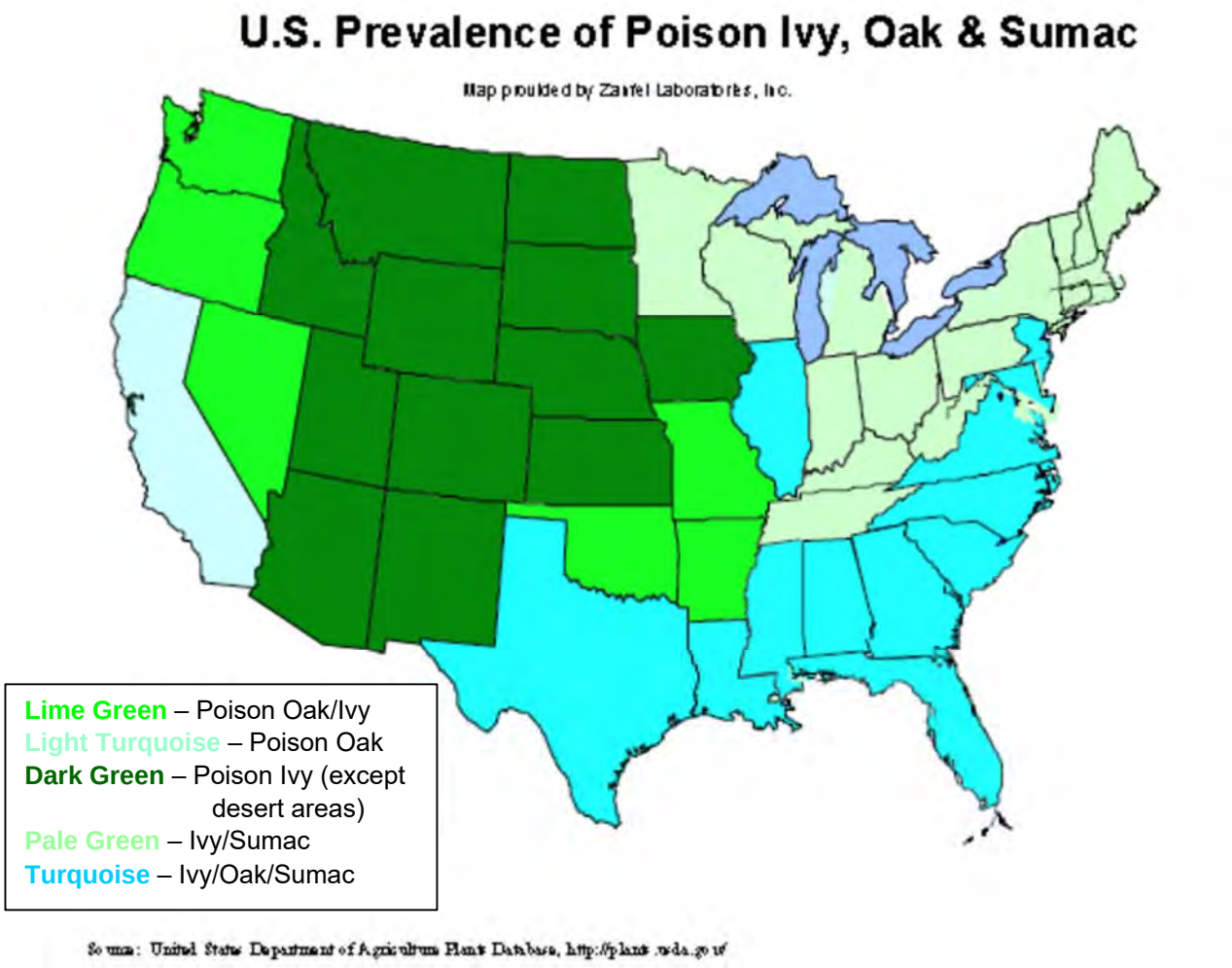
Poison oak can be present as a sparsely-branched shrub. Poison oak can grow anywhere in the United States with the exception of Hawaii, Alaska, and some southwest areas that have desert climates. Poison oak is similar to poison ivy in that it has the same leaflet configuration; however, the leaves have slightly deeper notches.

Poison sumac can be present in the form of a flat-topped shrub or tree. It has fern-like leaves, which are velvety dark green on top and pale underneath. The branches of immature trees have a velvety “down.” Poison sumac has white, “hairy” berry clusters. Poison sumac grows exclusively in very wet or flooded soils, usually in swamps and peat bogs, in the eastern United States.

Poison Ivy

Poison Oak

Poison Sumac



To prevent exposure to these poisonous plants:

- Wear proper PPE, including long sleeves, long pants, boots, and gloves.
- Barrier skin creams, such as lotion containing bentoquatum (Tecnu®), may offer some protection prevent the occurrence of exposure symptoms.
- Contact with poison ivy, sumac, or oak may lead to a skin rash, characterized by reddened, itchy, blistering skin which needs first aid treatment. Employees with known allergies should identify themselves to the SSO or Project Manager prior to starting field work as a precautionary measure. If you believe you have contacted one of these plants:
    - Immediately wash skin thoroughly with soap and water, taking care not to touch your face or other body parts.
    - Contact the People and Safety Team and Project Manager immediately after caring for affected skin.

- Wash exposed clothing separately in hot water with detergent.

- After use, clean tools, and soles of boots with rubbing alcohol or soap and lots of water. Urushiol can remain active on the surface of objects for up to 5 years.
- If a rash occurs, contact the People and Safety Team and complete and submit an Incident Report Form. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

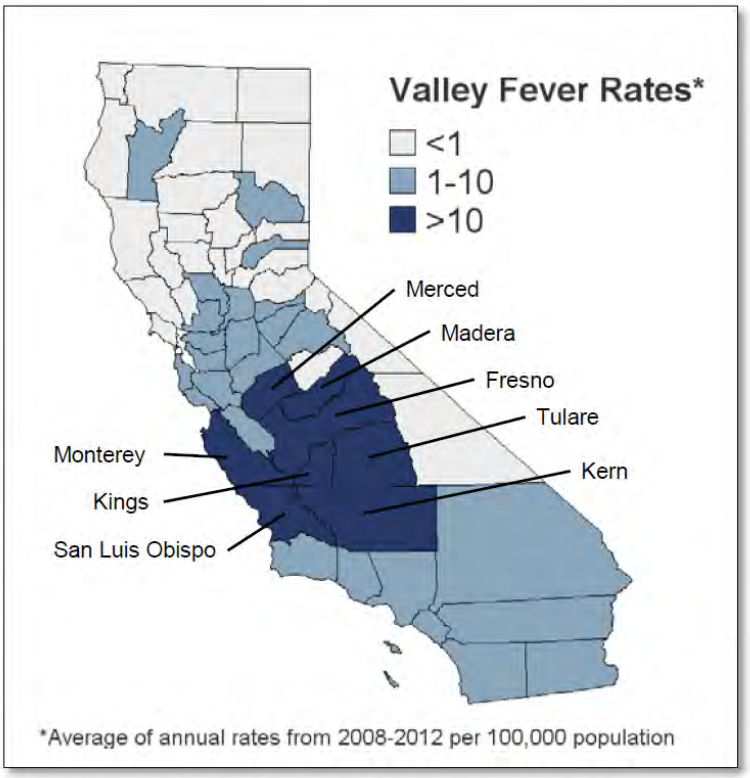
1.7 Sewage and Bacterial Impacted Sediments

Some project work may be conducted at sites that serve or have served as a combined sewer overflow and consequently may have received untreated sanitary sewage from numerous sources. Decomposed sewage can potentially be encountered within sites and their sediments. Sediments could contain soil and marine microorganisms, and bacterium associated with sewage. Many of these bacterium can cause illness through ingestion, direct contact, or the inhalation of a bio-aerosol possibly in the form of dust. Potential respiratory exposure to biological agents can also occur through the inhalation of aerosols produced during sediment handling activities. PPE as identified in the site-specific HASP will be worn to minimize potential exposures. Employees will follow the decontamination or disposal procedures identified in the HASP.

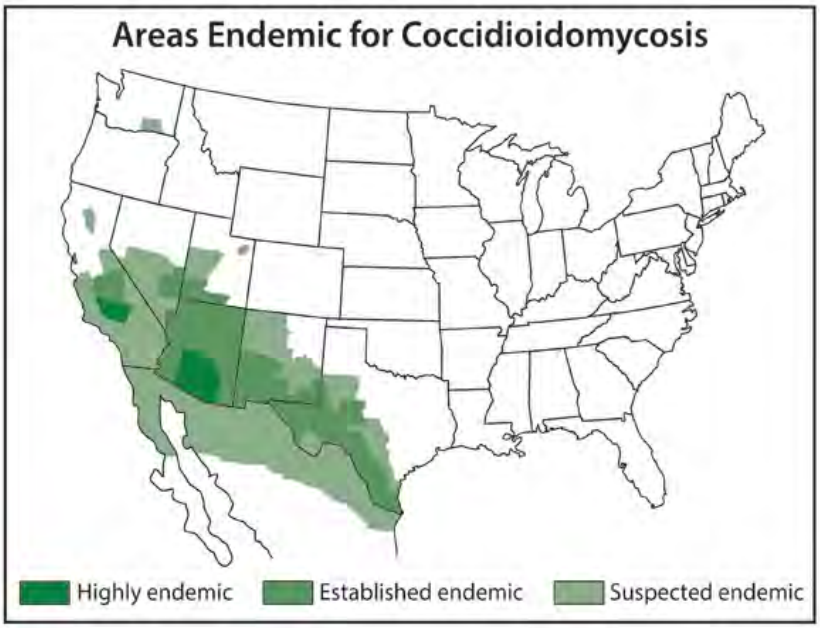
1.7.1 Fungal Spores in Soil – Valley Fever

Valley Fever is an illness that usually affects the lungs. It is caused by the fungus *Coccidioides immitis* that lives in the top 2 to 12 inches of soil in many parts of California. When fungal spores are present, any work activity that disturbs the soil, such as digging, grading, or other earth moving operations, or vehicle operation on dirt roads, can cause the spores to become airborne, therefore increasing the risk of Valley Fever. All employees on sites where the fungus is present, and who are exposed to dusty conditions and wind-blown dusts are at increased risk of becoming infected.

Valley Fever fungal spores are too small to be seen, and there is no reliable way to test the soil for spores before working in a particular place. Valley Fever can be found throughout the southwestern United States, parts of Mexico, and South America. Some California counties consistently have Valley Fever fungus present in the soil. In these regions Valley Fever is considered endemic. Health departments track the number of cases of Valley Fever illness that occur. This information is used to map illness rates as seen on the figures below from the Center of Disease Control Valley Fever Awareness website.



Rates of reported Valley Fever cases in California counties from 2008–2012. Darkest colored counties had the highest rates of Valley Fever.



When present, symptoms usually occur between 7 to 21 days after breathing in spores, and can include:

- Cough
- Fever
- Chest pain
- Headache
- Muscle aches
- Rash on upper trunk or extremities
- Joint pain in the knees or ankles
- Fatigue

Symptoms of Valley Fever can be mistaken for other diseases such as the flu (influenza) and TB (tuberculosis), so it is important for employees to obtain medical care for an accurate diagnosis and possible treatment.

While there is no vaccine to prevent Valley Fever, the following important steps must be taken in order to limit risk:

- Determine if the worksite is in an endemic area. Contact the local health department for more information about the risk in the county GEI is performing work that may disturb soils.
- Prepare work plans and work practices that reduce employee's exposure, which may include:
    - Provide air conditioned cabs with properly maintained dust filters for vehicles that generate heavy dust and make sure employees keep windows and vents closed.
    - Suspend work during heavy winds.
- When exposure to dust is unavoidable, National Institute for Occupational Safety and Health (NIOSH)-approved respiratory protection with particulate filters rated as N95, N99, N100, P100, or High Efficiency Particulate Air (HEPA) must be provided. The Project Manager must work with the Safety Team to develop and implement a respiratory protection program in accordance with California's Occupational Safety and Health Administration (Cal/OSHA's) Respiratory Protection standard (8 CCR 5144) for the project.
- Take measures to reduce transporting spores offsite, such as:
    - Clean tools, equipment, PPE, and vehicles before transporting offsite.
    - If employee's clothing is likely to be heavily contaminated with dust, provide coveralls and change rooms, and showers where possible.

1.8 Injury Reporting

If a GEI employee suffers an injury, bite, or sting on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Safety Officer.

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or Supervisor/Project Manager and submitted to the People & Safety Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident Report Form, the Regional Health & Safety Officer (RHSO) will conduct an investigation and evaluation on what happened and how and why it happened. The Corporate Health and Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other appropriate measures to minimize the potential for future injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.9 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.10 References

http://www.cdc.gov/ncidod/dvbid/westnile/index.htm
http://www.cdc.gov/ncidod/dvbid/westnile/qa/insect_repellent.htm
http://www.epa.gov/pesticides/health/mosquitoes/insectrp.htm
http://www.cdc.gov/niosh/topics/lyme/
Protecting Yourself from Ticks and Mosquitoes, NIOSH Fast Facts, Publication No. 2010-119
http://npic.orst.edu/pest/mosquito/ptc.html
http://www.cdc.gov/features/valley-fever-10-things/
https://www.cdph.ca.gov/HealthInfo/discond/Documents/VFGeneral.pdf
https://blog.epa.gov/blog/tag/mosquitoes/

1.11 Attachments

None

1.12 Contact

Health&SafetyTeam@geiconsultants.com

1.13 Review History

- June 2016
- June 2014
- November 2013
- October 2010

STANDARD OPERATING PROCEDURES

SOP No. HS-002 Infectious Materials and Bloodborne Pathogens Exposure Control Plan

1.1 Objective

GEI personnel may come in contact with potentially infectious agents (materials) when performing first aid or cardiopulmonary resuscitation (CPR). Employees may also come into contact with these agents when working at certain contaminated sites (i.e., urban sites, discarded contaminated needles, or sewer outfall exposures). This standard operating procedure (SOP) has been developed to minimize the potential for exposure to employees who may contact, directly or indirectly, infectious agents.

1.2 General

This SOP is intended for use by employees engaged in work with the potential for contact with infectious materials and bloodborne pathogens. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for encounters with infectious materials or bloodborne pathogens and the control methods to be implemented by GEI employees. Exposure determinations are made by listing job functions impacted by potential exposure. The HASP will list job classifications or tasks in which occupational exposure could occur such as employees collecting samples or expected to provide First Aid. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Safety page of the GEI intranet.

Engineering and work practice controls shall be used to eliminate or minimize employee exposure. Exposure determinations are made without regard to the use of personal protective equipment. When differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials. *Universal Precautions (i.e., treat all potentially infectious materials as if it were infected) will be used by GEI employees.*

1.3 Exposure Control Plan

1.3.1 Standard Procedures

A written Exposure Control Plan applicable to potential occupational exposure to blood or other potentially infectious materials will be developed as necessary based on project hazards. This plan will be accessible to each affected employee.

Sampling of materials containing potentially infectious materials will be performed in a manner that minimizes the potential for creating splashes, droplets, or aerosols. Mechanical pipetting devices will be used for manipulating sanitary sewer effluent. Mouth pipetting is prohibited.

The use of glassware or equipment with sharp or pointed edges will be kept at a minimum to reduce the potential of injury that would create a direct route of entry into the body for infectious materials.

Minor cuts, scratches, or other breaks in the skin barrier will be covered prior to the handling of infectious materials. Employees experiencing exudative lesions or weeping dermatitis will refrain from direct contact with infectious materials.

Eating, drinking, smoking, or application of cosmetics is not permitted in areas where potentially infectious materials are handled or sampled.

Employees will wash and disinfect their hands, face, or other potentially contaminated skin surfaces upon completing the handling of infectious or potentially infectious agents or after rendering first aid. Hand washing facilities are readily available at all work locations. When provision of hand washing facilities is not feasible, either an appropriate antiseptic hand cleanser used in conjunction with clean cloth/paper towels or antiseptic towelettes will be provided.

All equipment and environmental and working surfaces will be cleaned and decontaminated after contact with blood or other potentially infectious materials. Specimens of blood or other potentially infectious materials (i.e. bandages) will be placed in a container which prevents leakage during collection, handling, processing, storage, transport, or shipping.

1.3.2 Personal Protective Equipment

When there is a potential for occupational exposure GEI will provide, at no cost to the employee, appropriate personal protective equipment (PPE). PPE will be worn to reduce the potential of exposures to splashes or aerosols. At a minimum, PPE will include safety glasses and appropriate gloves, but may also require the use of face, respiratory, foot, and full-body protection. Refer to the site-specific HASP for specific PPE requirements.

Disposable PPE used in the handling or sampling of infectious materials will be appropriately disposed of and not reused.

1.3.3 Medical Monitoring

Medical monitoring is required for an employee when a potential workplace exposure has occurred. GEI will make available the hepatitis B vaccine and vaccination series to all employees who have occupational exposure, and post-exposure evaluation and follow-up to all employees who have had an exposure incident. These are made available at no cost to the employee. The employee must follow the GEI Incident Reporting procedures regarding the potential exposure as soon as possible. For infectious agents in which a medically accepted vaccination has been developed (e.g., hepatitis B virus) (HBV) potentially exposed employees will be given the option to receive an inoculation at no cost. Employees who have been exposed will be given the option to receive a confidential medical evaluation also at no cost. Required records for exposed

employees will be kept confidential. GEI will keep these medical records for at least the duration of employment plus 30 years and will be maintained for 3 years from the date on which the training occurred. All records required to be maintained shall be made available and GEI will comply with the requirements involving transfer of records set forth in 29 CFR 1910.1020(h).

1.3.4 Training

Training will be conducted at the time of initial assignment to tasks where exposure may take place and at least annually thereafter. All training for employees shall be provided within one year of their previous training. Employees with a reasonable risk for exposure must complete Bloodborne Pathogen training covering the following topics:

- An explanation of the Occupational Health and Safety Administration (OSHA) bloodborne pathogen standard.
- A general explanation of bloodborne diseases.
- An explanation of the modes of transmission of bloodborne diseases.
- Communications of hazards to employees.
- An explanation of the GEI's Bloodborne Pathogen SOP and exposure control plan.
- Appropriate methods for recognizing tasks that involve potential exposure.
- An explanation of the use and limitations of methods to prevent exposure.
- Proper types, use, handling, decontamination, and disposal of PPE.
- The availability of HBV vaccines and the procedures for obtaining a vaccination.
- Appropriate actions to take during an emergency involving bloodborne pathogens.
- Post-exposure procedures.
- An explanation of required signs and labels.

1.4 Injury Reporting

If a GEI employee suffers an injury on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Health and Safety Officer (RHSO).

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or Supervisor/Project Manager and submitted to the People and Safety Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident Report Form, the RHSO will conduct an investigation and evaluation on what happened and how and why it happened. The Corporate Health and Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other

appropriate measures to minimize the potential for future injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.5 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.6 Attachment

None

1.7 Reference

OSHA 29 CFR 1910.1030 – Bloodborne Pathogens

1.8 Contact

SafetyTeam@geiconsultants.com

1.9 Review History

- October 2018
- June 2016
- June 2014
- November 2013
- January 2011
- November 2010

STANDARD OPERATING PROCEDURE
HS-004 Driver Safety

1.1 Objective

GEI has implemented a Safe Driving Program to encourage safe driving habits and promote the ongoing safety of our staff and the communities where we work. For more information, refer to the Operation of Vehicles section of GEI's Employee Handbook.

This Standard Operating Procedure (SOP) provides requirements and recommendations to minimize the potential risks while operating or riding in a motor vehicle.

1.2 General

GEI employees will adhere to the following requirements when operating a vehicle while conducting business on behalf of GEI. These requirements apply to GEI-owned, rental, and personal vehicles used to conduct GEI business:

- Employees must maintain a valid and current driver's license.
- Employees using a personal vehicle for work-related travel must have proper insurance coverage that meets the requirements in the state in which they reside.
- Employees must wear their safety belt while in a moving vehicle.
- Vehicle incidents will be reported in accordance with GEI's Incident Reporting procedures (*refer to* GEI's Safety App for smart phones or the Safety page on the GEI intranet.).
- Vehicles will be properly maintained and safely operated (*refer to* GEI's Fleet Maintenance Program).
- Employees will follow safe driving behaviors, which include limiting distractions such as manipulating radios or other equipment that may cause a distraction. Employees should not exceed the posted speed limit and should maintain a safe distance between other vehicles.
- When parking a vehicle at a job site, the employee should position the vehicle in a manner which reduces or eliminates the need to operate the vehicle in reverse. It is recommended, a safety cone should be placed at the rear of the vehicle after parking the vehicle and be removed prior to moving the vehicle. This precautionary measure makes the employee aware of other vehicles, equipment, and structures within the backup radius of the vehicle.

When driving an unfamiliar vehicle (rental or GEI-owned), it is the driver's responsibility to orient themselves to the vehicle by:

- Walking around the vehicle to observe the condition of the vehicle and hazards that could be within the travel path.
- Becoming familiar with the size of the vehicle.
- Note if the vehicle has anti-lock braking system (ABS[1]).
- Adjusting mirrors (rear and side).
- Adjust seats to be situated as far back as safely practical, away from the air bag, located in the steering wheel.
- Becoming familiar with dashboard, center console, and steering controls.
- Locating the turn signals, windshield wipers, lights, emergency flashers, and the heating, air conditioning, and defrost controls.

1.3 Driving Defensively

Driving defensively means not only taking responsibility for oneself and actions but also keeping an eye on "the other guy." Good defensive drivers may be able to anticipate what the other driver will do next. GEI recommends the following guidelines to help reduce risks while driving:

- Do not start the vehicle until each passenger and any belongings are secured in the vehicle.
- Remember that driving above or below the speed limit can increase the likelihood of a collision.
- Be aware of impaired drivers; if a car is straddling the center line, weaving, making wide turns, stopping abruptly, or responding slowly to traffic signals, the driver may be impaired or using a cellular telephone. Avoid an impaired driver by turning right at the nearest corner or exiting at the nearest exit.
    - If it appears that an oncoming car is crossing into your lane, pull over to the roadside, sound the horn, and flash the headlights.
    - If an unsafe or suspicious driver is observed, notify the police.
- Follow the rules of the road. Do not contest the "right of way" or try to race another car during a merge. Always be respectful of other motorists.

[1] ABS is a mechanism that allows the wheels on a vehicle to maintain contact with the surface of the road, based on inputs from the driver (braking), to prevent the wheels from locking up (ceasing rotation) and to avoid an uncontrolled skid.

- Allow large vehicles, including tractor trailers, extra breaking distance, turning radius, and avoid traveling in the other driver's blind spots.
- Do not follow too closely. GEI employees should use a minimum of "3-second following distance."
- While driving, be cautious, aware, and responsible.
- Use extra caution, observe road signs, and reduce speed in construction areas and school zones.
- Always be aware of pedestrians, bicyclists, and motorcyclists.

1.4 Cellular Phone Use and Other Distractions

Refer to the *Portable Communication Device Use While Driving* section of the GEI Employee Handbook for GEI's policy on the use of cellular telephones while operating a vehicle.

1.5 Drugs and Alcohol

The use of illegal drugs or alcohol is prohibited when driving a vehicle on GEI business. Be aware of the side effects of prescription and over-the-counter medications which can impair an employee's ability to drive.

1.6 Adverse Driving Conditions

When operating a vehicle, its possible adverse driving conditions may be encountered. Below is a list of possible conditions and how they can be mitigated.

1.6.1 Driving at Night

Vision maybe limited at night due to impairment of the driver's depth perception, color recognition, and peripheral vision. Another factor adding danger to night or early morning driving is fatigue. Drowsiness makes driving more difficult by dulling concentration and slowing reaction time. Effective measures to minimize these hazards by preparing the car and following guidelines:

- Check the headlights to ensure they are properly aimed. If you notice the headlights are not properly aimed, report it to the Branch Manager, or if applicable the rental car agent. Misaimed headlights blind other drivers and reduce the driver's ability to see the road.
- In addition to the known hazards of consuming alcohol prior to driving, night driving can potentially be affected because the recovery rate of glare from headlights is prolonged. Thus reducing your ability to see.

- Smoking in GEI vehicles and rentals is not permitted. When driving a personal vehicle for business, avoid smoking while driving. Nicotine and carbon monoxide may hamper night vision.
- Observe driving safety as soon as the sun goes down. Twilight is one of the most difficult times to drive, because the eyes' pupils are constantly changing to adapt to the growing darkness Always use headlights at dusk and at dawn; lights will not help the driver see better in early twilight, but they will make it easier for other drivers to see your car. Drive at a speed that allows you to see the road that is within the headlights span. Driving in a manner that prevents you from seeing hazards as they are illuminated is known as overdriving the headlights; it may be necessary for the driver to reduce speed to be prepared to brake within the illuminated area of the headlights.
- If an oncoming vehicle does not lower beams from high to low, avoid glare by watching the right edge of the road and using it as a steering guide.
- The driver should make frequent stops for light snacks and exercise. If the driver is too tired to drive, stop in a safe area and get some rest.

1.6.2 Snow/Freezing Conditions

When snow and ice are present, be prepared by following these winter driving safety tips.

1.6.2.1 Prepare the Vehicle Before a Snowstorm

- Check under the hood and take a look at the vehicles cooling system. Make sure the vehicle contains adequate antifreeze and the hoses are in good condition.
- Test heaters and defrosters ahead of time to make sure they are in good working condition.
- Test the windshield wipers and check the condition of the wiper blades. If wipers leave streaks on the windshields, replace the blades at the next possible opportunity. Keep the receipt to expense the cost with GEI or with the car rental company.
- It is recommended that a windshield washer/antifreeze solution is used during winter conditions.
- Check the lights on the vehicle and periodically clear them of snow and dirt.
- Vehicle batteries need extra power in cold conditions. Make sure the battery's terminals are clean and cables are secure.
- Determine if the vehicle has a anti-lock brake (ABS) system.
- Keep the gas tank at least half-full in the winter to help avoid gas line freeze up.

1.6.2.2 Driving During and After a Snowstorm

- Wear sunglasses to aid in limiting reflection from snow.
- Be aware of blind spots created by snow banks.
- Be extra cautious of pedestrians and other vehicles in intersections.
- Allow extra time for braking and increase the distance between your car and the car immediately in front of the car.
- Reduce speed and do not exceed the posted limit.
- If the tires starts to lose traction, remove the foot off the gas and gradually reduce speed. Accelerate slowly once traction is regained.
- If the vehicle starts to skid, and does not have anti-lock brakes, steer into the skid. This will bring the back end of the car in line with the front. Avoid using the brakes. If the vehicle does have anti-lock brakes, firmly brake as you steer into the skid.

1.6.3 Driving In the Rain

To prevent losing control of the car on wet pavement, take these preventive measures.

- Prevent skids by driving slowly and carefully, especially on curves.
- Steer and brake with a light touch.
- When necessary to stop or slow, do not brake hard or lock the wheels.
- Maintain mild pressure on the brake pedal.

Skidding
If the car begins to skid, ease the foot off the gas, and carefully steer the car in the direction you want the front of the car to go. For cars without anti-lock brakes, avoid using the brakes. This procedure, known as "steering into the skid," will bring the back end of the car in line with the front. If the car has anti-lock brake systems (ABS), brake firmly as you steer into the skid.

Hydroplaning
Hydroplaning happens when the water in front of the tires builds up faster than the car's weight can push it out of the way. The water pressure causes the car to lose contact with the road surface and slide on a thin layer of water between the tires and the road. At this point, the car can be completely out of contact with the road, making it possible for the driver to skid or drift out of the lane, or even off the road.

To avoid hydroplaning, keep the tires properly inflated and maintain good tread on the tires. If tires need to be replaced on a company vehicle, notify the branch manager or their designee. Slow down when roads are wet, and stay away from puddles. Try to drive in the tire tracks left by the cars in front of the vehicle. If the car begins to hydroplane, do not brake or turn suddenly. This could throw the car into a skid. Ease the foot off the gas until the car slows; accelerate slowly once traction is regained. If braking is needed, do so gently with light pumping actions. If the car has ABS, brake normally; the car's computer will mimic a pumping action, as necessary.

If weather conditions worsen to the point where the driver is not comfortable driving, pull the vehicle over to a safe location until conditions improve. Do not drive during severe weather conditions. Do not attempt to drive on roads with standing water or that have been flooded. Find an alternate route if these conditions exist.

1.6.4 Off Road

If operation of a vehicle is required off public or private roads or in situations where four-wheel-drive vehicles are required, the appropriate vehicle for the situation will be used.

Be sure any gear or equipment is secured inside the vehicle so it doesn't bounce around while the vehicle is off-road.

- Know the underside of the vehicle. Look under the vehicle and learn where the lowest-hanging parts are located so they are not damaged.
- Scout tricky terrain on foot. Don't hesitate to get out of the vehicle to examine, up close, the terrain and soil conditions. And be sure to scout out what's on the other side of a hill ahead of time so there are no surprises.
- Drive cautiously. Drive, "as slow as possible, as fast as necessary." Remember to use the gears to efficiently manage engine power, braking, and torque.
- Create a mental picture. Look ahead and visualize the paths to the vehicle will travel. Follow those paths.
- Drive straight up and down hills. Avoid diagonal lines that put the vehicle in a situation where it might roll.

1.7 Driver Training

GEI employees are required to complete driver safety training every 3 years. This training is managed by the People Team and will be assigned through GEI's e-learning provider.

1.8 Injury Reporting

GEI employees will report incidents involving GEI personnel or subcontractor personnel, such as: lost time injuries, injuries requiring medical attention, near miss incidents, fires, fatalities, accidents involving the public, chemical spills, vehicle accidents, and property damage. The following steps must be followed when an incident occurs:

1. In life-threatening situations, immediately call 9-1-1.
2. Stop work activity to address any injury, illness, property damage, spill or other emergency.
3. **Immediately** report any incidents to your Supervisor/Project Manager and Regional Health & Safety Officer.
4. If your injury or illness is not life-threatening, call Medcor Triage at 1-800-775-5866 to speak with a medical professional.
5. Complete an Incident Report Form **immediately** after addressing the incident. Report forms are available on GEI's Safety App (for smart phones) and on the Safety page on the GEI intranet.

For vehicle accidents involving another vehicle or damage to property, the employee will take pictures of each vehicle or property involved in the incident and obtain a police report. In some municipalities police will not be dispatched to a non-injury accident, but every effort needs to be made to try and obtain the report.

1.8.1 Injury Triage Service

If a GEI employee experiences a work-related injury that is not life-threatening, the employee will initiate a call to Medcor Triage at 1-800-775-5866. The injured employee will detail any medical symptoms or complaints which will be evaluated by a Registered Nurse (RN) specially trained to perform telephonic triage. The RN will recommend first aid self-treatment or refer the injured employee for an off-site medical evaluation by a health professional at a clinic within GEI's workers compensation provider network. GEI employees are still required to follow our Accident Reporting procedures as listed above.

1.9 Limitations

Follow safety procedures as defined in the site-specific HASP.

1.10 References

National Safety Council
Oklahoma Safety Council
GEI Consultants, Inc. Employee Handbook

1.11 Attachments

None

1.12 Contact

SafetyTeam@geiconsultants.com

1.13 Review History

- December 2017
- November 2016
- May 2014
- November 2013
- January 2011

STANDARD OPERATING PROCEDURES

SOP No. HS-006 Excavations and Trenches

1.1 Objective

The objective of this Standard Operating Procedure (SOP) is to highlight the hazards and safety procedures when work activities include excavations and/or trenches. The following guidelines will be followed when excavations or trenches are present on GEI projects.

1.2 General

This SOP is intended for use by employees engaged in work on project sites that include trenching and/or excavation operations. The site-specific health and safety plan (HASP) must include a hazard assessment for the project that identifies the potential for trenching and excavation hazards and the control methods to be implemented by GEI employees. These hazards must be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Safety page of the GEI intranet.

An "excavation" is any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal.

A "trench" (trench excavation) is a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet.

Do not enter a trench or excavation without consulting with the Project Manager, Corporate Health and Safety Officer (CHSO), or Regional Health and Safety Officer (RHSO).

1.2.1 Personal Protective Equipment

Employees will be provided with the personal protective equipment (PPE) necessary to help protect them from the hazards of work activities related to excavations and/or trenches. All employees will wear a hard hat, steel toe or composite toe boots, and safety glasses at a minimum. In addition, face shields, gloves, fall protection and hearing protection may be required. PPE must be maintained in good condition, kept clean and properly stored when not in use. More information regarding PPE is located in Section 6 of GEI's Corporate Health and Safety Program.

1.3 Hazards

Hazards associated with excavations and trenches can include collapse, falls, falling objects, hazardous atmospheres, and incidents involving mobile equipment. One cubic yard of soil can weigh as much as a car.

1.4 Entry

GEI employees will not enter trenches or excavations that do not comply with OSHA 29 CFR 1926.650. If a project requires GEI employees to enter a trench or excavation, the trench or excavation must meet the following requirements described in the following sections.

Do not enter a trench or excavation without consulting with the Project Manager, Corporate Health and Safety Officer (CHSO), or Regional Health and Safety Officer (RHSO).

1.4.1 Competent Person

The excavation must be inspected prior to the start of each shift by a competent person who most likely will work for the contactor performing the work. The competent person is an individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary, or dangerous to workers, soil types and protective systems required, and who is authorized to take prompt corrective measures to eliminate these hazards and conditions. GEI generally does not act as the competent person.

1.4.2 Soil Type

The competent person for the project will determine what the soil type is and what type of protective system will be implemented. The type of soil where the excavation or trench is being dug has significant influence on what type of protective system will need to be in place. There are four types of soil: stable rock, type A, type B, and type C. As you progress from stable rock to type C, the cohesive properties of the soil change the soil becomes less stable.

1.4.3 Protective System

A protective system is required for trenches or excavations greater than 5 feet in depth unless the excavation is made entirely in stable rock. In special situations the competent person may require a protection system for an excavation that is less than 5 feet deep. The competent person is responsible for assessing the soil type and the protective systems required for a specific trench when an excavation is less than 20 feet deep. If the excavation is greater than 20 feet in depth, the protection system requires a design by a registered professional engineer or based on tabulated data prepared and/or approved by a registered professional engineer.

The protective system will be designed based on soil type, depth of excavation, water level, loads adjacent to the excavation, changes in weather conditions, or other operations in the area. Protective systems can include sloping or benching of the sidewalls, shoring the sidewalls using an approved support system, or shielding workers with a trench box or other similar type of support.

The different types of protective systems include:

Benching is a method of protecting workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels of steps, usually with vertical or near vertical surfaces between levels. Benching cannot be done with Type C soil.

Sloping involves cutting back the trench wall at an angle inclined away from the excavation.

Shoring requires installing aluminum hydraulic or other types of support structures to prevent soil movement and cave-ins.

Shielding protects workers by using trench boxes or other types of supports to prevent soil cave-ins.

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

1.4.4 Access and Egress

Excavations and trenches greater than 4 feet in depth require a safe access and egress including ladders, steps, or ramps. These points of access and egress are to be no greater than 25 feet of lateral travel in any direction.

1.4.5 Atmospheric Hazards

Where oxygen deficiency (atmospheres containing less than 20.7% oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation will be tested before employees enter excavation.

1.5 Subcontractor Oversight

When GEI is overseeing excavation activities performed by a subcontractor, the following safety hazards should be monitored:

- Care must be taken not to create new hazards like narrow walkways along edges of an excavation.
- Heavy equipment must not be parked or working at the edge of the excavation.
- Spoils should not be stockpiled within 2 feet of the trench edges.
- Confirm with subcontractor that underground utilities have been located before any excavation or trenching activities begin (*refer to* SOP HS-014 Utility Mark-out).
- Confirm with the subcontractor that the excavation or trench has been tested for hazardous atmospheres before entering.
- Confirm with the subcontractor that the excavation or trench has been inspected by a competent person before each work shift and after any type of precipitation. If hazards are identified during this inspection, verify that the hazards are controlled prior to entering the trench or excavation.
- GEI employees will not work under raised or suspended loads.
- Excavations/trenches must be protected at the end of a work shift if they are to be left open. These trenches/excavations must be covered and a sign that reads "Hole" must be placed in a location that will notify anyone of the hazard. Or a secure barricade will need to be installed.

In circumstances where GEI employees are working on sites where a contractual agreement with the excavation contractor does not exist and we cannot confirm the above stated conditions, entry into trenches or excavations will not be conducted. Any safety concerns that arise should be communicated to the Project Manager and, if necessary, the client.

1.6 Injury Reporting

If a GEI employee suffers an injury on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Safety Officer.

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or Supervisor/Project Manager and submitted to the People & Safety Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident Report Form, the Regional Health & Safety Officer (RHSO) will conduct an investigation and evaluation on what happened and how and why it happened.

The Corporate Health and Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other appropriate measures to minimize the potential for future injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.7 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

Some states, including Massachusetts, require a trench permit prior to trenching or excavation activities. Verification of local requirements will be evaluated in the planning stage.

1.8 References

OSHA 29 CFR 1926.650 – Subpart P; *Excavations*
OSHA Construction eTool – http://www.osha.gov/SLTC/etools/construction/index.html
OSHA FactSheet Trenching and Excavation Safety – viewed on 9/13/2016
https://www.osha.gov/OshDoc/data_Hurricane_Facts/trench_excavation_fs.pdf

1.9 Attachments

None

1.10 Contact

Health&SafetyTeam@geiconsultants.com

1.11 Review History

- September 2016
- May 2014
- November 2013
- January 2011
- Initial Version Date Unknown

STANDARD OPERATING PROCEDURES

SOP No. HS-008a Non-Powered Hand Tools

1.1 Objective

This Standard Operating Procedure (SOP) is intended for use by employees working with non-powered hand tools. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the hazards associated with the non-powered hand tools that will be used. These hazards should be reviewed during the project safety briefing and documented on the Project Safety Briefing form, found on the Safety page of the GEI intranet.

1.2 General

Misuse of hand tools accounts for the majority of accidents and injuries involving hand tools. Only use a tool for the task which it was designed for. If the right tool isn't available contact the Project Manager and discuss what is needed. Improper maintenance is another leading cause of injuries. Employees using hand tools may be exposed to a number of other potentially serious hazards: falling objects (i.e., objects can fall as a result of contact with tools or objects which are abrasive or splash), harmful dust, fumes mists, vapors, and gases, as well as contact with electrical power sources.

1.2.1 Condition of Tools

All hand tools, whether furnished by GEI or the employee, will be maintained in safe working condition. All hand tools must be inspected before use. Never use a tool if its handle has splinters, burrs, cracks, splits or if the head of the tool is loose. Never use impact tools such as hammers, chisels, punches or steel stakes having mushroomed (flattened) heads. Tag worn, damaged or defective tools "Out of Service" and do not use them; notify your Branch Manager or Project Manager so that the tool can be replaced or repaired. If the tools cannot be repaired they will be disposed of properly. GEI does not issue or permit the use of unsafe hand tools.

1.2.2 Personal Protective Equipment

Employees using hand tools will be provided with the personal protective equipment (PPE) necessary to protect them from the hazard of the tool as well as the associated hazards with using the tool. (i.e., projectile debris, dust, etc.). All employees will wear work gloves, steel toe or composite toe boots, and safety glasses at a minimum. In addition, face shields and hearing protection may be required. Most hand injures can be avoided with the proper use of PPE. PPE must be maintained in good condition, kept clean and properly stored when not in use. More information regarding PPE is located in Section 6 of GEI's Corporate Health and Safety Program.

1.2.3 General Safe Practices

Never wear sandals, open-toed or canvas shoes when working with tools. Always tie back long hair. Avoid loose-fitting clothes which might become entangled in a tool. Always remove rings and other jewelry. Make sure your grip and footing are secure when using large tools. Never carry tools up ladders; use a tool belt, hoist, or a rope. Use extra caution when using tools at heights – a falling tool could kill a co-worker. Always pass a tool to another person by the handle – never toss it to them. Never use a tool with hands are wet, oily, or greasy. Select ergonomically-designed tools for work tasks when movements are repetitive and forceful. Always make sure observers are at a safe distance. Always secure work with a vice, clamp, or other support.

1.3 Non-Power Hand Tools

Non-powered hand tools include anything from axes to wrenches. Even though the tool is powered by human inertia, injuries from improper use of non-powered hand tools often involve severe disabilities.

1.3.1 Knives

Only use a knife with a sharpened blade. Pull the knife through the object and away from your body; pulling motions are easier to manage. Never use a knife if its handle has splinters, burrs, cracks, splits or if the blade is loose. Knives should never be used as screwdrivers, pry bars, or can openers. Never pick up knives by their blades. Always carry knives with their tips/points toward the floor. Never carry knives, scissors, or other sharp tools in pockets. Never attempt to catch a falling knife. When not in use, knives should be stored in sheaths. Box cutters will be self-retracting.

1.3.2 Wrenches

Never use wrenches that are bent, cracked, badly chipped, or having loose or broken handles. Discard any wrench with spread or battered jaws; if the handle is bent; or if a wrench has broken or battered points and notify your Branch Manager so that a replacement can be made. Never slip a pipe over a single head wrench handle to increase leverage. Never use a shim to make a wrench fit. Pull on a wrench using a slow, steady motion. Do not use push force on a wrench; you could lose your balance if the wrench slips.

1.3.3 Screwdrivers

Always match the size and type of screwdriver blade to fit the head of the screw. Do not hold the work piece against your body while using a screwdriver. Never put your fingers near the tip of a screwdriver when tightening a screw. Never use a screwdriver to make a starting hole for screws. Never use a screwdriver as a chisel, pry bar, or nail puller. When performing electrical work, always use an insulated screwdriver. Never use a screwdriver to test the charge of a battery.

1.3.4 Hammers

Never use a hammer if your hands are oily, greasy or wet. Always check behind you before swinging a hammer. Use a claw hammer for pulling nails. Never strike nails or other objects with the "cheek" of the hammer. Do not strike a hardened steel surface, such as a cold chisel, with a claw hammer. Never strike one hammer against another hammer. Never use a hammer as a wedge or a pry bar.

1.3.5 Pliers

Never use pliers which are cracked, broken, or sprung. Never use pliers as a wrench or a hammer. Do not attempt to force pliers by using a hammer on them. Never slip a pipe over the handles of pliers to increase leverage. When performing electrical work, always use insulated pliers. When using diagonal cutting pliers, shield loose pieces of cut material from flying into the air by using a cloth or your gloved hand.

1.3.6 Snips

Never use snips as a hammer, screwdriver, or pry bar. Always wear safety glasses or safety goggles when using snips to cut materials. Always wear work gloves when cutting materials with snips. Keep the blade aligned by tightening the nut and bolt of the snips. Never use straight cut snips to cut curves. Always use the locking clip on the snips when you have finished using them. Never leave or store snips in the open position.

1.3.7 Hand Saws

Always keep handsaws sharp and free of rust to prevent them from binding or jumping. Never carry a saw by the blade. Always hold the work piece firmly against a work table. Keep control of saws by releasing downward pressure at the end of the stroke. Never use an adjustable blade saw such as a hacksaw, coping saw, keyhole saw, or bow saw, if the blade is not taut. Oil saw blades after each use. Never force the saw through the cut as this may cause the saw to buckle or fly out of the groove and cause injury.

1.3.8 Chisels

Only use sharpened chisels. Never use chisels having mushroomed (flattened) striking heads. Whenever possible, hold a chisel by using a tool holder. Clamp small work pieces in a vise and chip towards the stationary jaw of the vise. Chip or cut away from yourself and keep both hands in back of the cutting edge. Always wear safety glasses or a face shield.

1.3.9 Vise and Clamps

Never use a vise having worn or broken jaw inserts, or having cracks or fractures in the body of the vise. Position the work piece in the vise so the entire face of the jaw supports the work piece. When clamping a long work piece in a vise, support the far end of the work piece by using an adjustable pipe stand or saw horse. Never slip a pipe over the handle of a vise to increase leverage. Never use a C-clamp for hoisting materials. Never use a C-clamp as a permanent fastening device.

1.3.10 Jacks

A manufacture's rated capacity must be clearly marked on all jacks and all jacks must have a stop indicator. When using a jack, never exceed the capacity of the stop indicator. Jacks should be lubricated and inspected regularly. When setting up a jack, ensure the base is centered on a firm, level surface. The jack head should also be placed against a level surface. Lift force should be applied evenly. Put a block under the base of the jack when the foundation is not firm. If it seems likely the cap could slip, place a block between the jack cap and load. Immediately block the load after it is lifted.

1.4 Injury Reporting

If a GEI employee suffers an injury on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Safety Officer.

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or supervisor/project manager and submitted to the People & Safety Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident Report Form, the Regional Health & Safety Officer (RHSO) will conduct an investigation and evaluation on what happened and how and why it happened. The Corporate Health & Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other appropriate measures to minimize the potential for future injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.5 Limitations

Follow safety procedures as defined in the site-specific HASP or in the manufacturer's specifications. Appropriate PPE must be worn correctly to provide the intended level of protection. If a hand tool is being used that is not identified in this SOP consult the manufacturer's literature and contact the Safety Team so we can include the information in a future version of this SOP.

1.6 References

OSHA Standards for the Construction Industry, Subpart I
Risk Analytics, LLC Hand Tools Training, 2006

1.7 Attachments

None

1.8 Contact

Health&SafetyTeam@geiconsultants.com

1.9 Review History

- July 2016
- May 2014
- August 2011
- October 2010
- One revision date unable to be found

STANDARD OPERATING PROCEDURES
SOP NO. HS-009 Hazardous Substances Exposure Management

1.1 Objective
This Standard Operating Procedure (SOP) is intended to outline the steps GEI employees will take to identify potential hazards associated with exposure to hazardous substances, the risks associated with these hazards, and the proper controls to use to minimize exposure. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential of encountering a hazardous substance and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Safety page of the GEI intranet.

1.2 General
A hazardous substance is any substance that has one or more of the following intrinsic properties:

- Explosiveness
- Flammability
- Ability to oxidize
- Human toxicity (acute or chronic)
- Corrosiveness (to human tissue or metal)
- Ecotoxicity (with or without bioaccumulation)
- Capacity, on contact with air or water, to develop one or more of the above properties

1.3 Hazard Identification
An initial identification of hazards should be done based on a review of available documents including lists of chemicals used on site, analytical data from soil, surface water, groundwater, air, spill history, site history, equipment on site, maps, photos, and a preliminary survey.

Once hazardous substances are identified the regulated exposure limits need to be identified. Each substance may have a state/federal exposure value for each of the following (if applicable):

Action Level – An airborne level, typically one-half of the permissible exposure limit (PEL) designated in Occupational Safety and Health Administration's (OSHA's) substance-specific standards, 29 CFR 1910, Subpart Z, calculated as an

8-hour time weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Ceiling Limit – The exposure limit a worker's exposure may never exceed.

Sampling and Analytical Error – A statistical estimate of the uncertainty associated with a given exposure measurement.

Short-Term Exposure Limit (STEL) – The average exposure to a contaminant to which a worker may be exposed during a short time period (typically 15-30 minutes).

Time Weighted Average (TWA) – The average exposure to a contaminant over a given period of time, typically 8 hours.

1.4 Risk Identification

Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances will be identified. GEI employees and GEI subcontractors who will be working on the site will be informed of risks that have been identified.

Risks to consider include, but are not limited to:

- Potential exposures exceeding the permissible exposure limits and published exposure levels
- Potential Immediately Dangerous to Life and Health (IDLH) concentrations
- Potential skin absorption and irritation sources
- Potential eye irritation sources
- Potential hazardous atmospheres, including oxygen deficiency and fire and explosion hazards

1.5 Engineering Controls, Work Practices, and Personal Protective Equipment for Employee Protection

Engineering controls, work practices, and personnel protective equipment (PPE) for substances regulated in OSHA Subpart G (Occupational Health and Environmental Control) and Subpart Z (Toxic and Hazardous Substances) will be implemented in to protect employees from exposure to hazardous substances and safety and health hazards.

1.5.1 Elimination/Substitution

The first control method should be to try and eliminate or substitute the hazards with a safer alternative. This is the most effective solution as shown is Figure 1 below. If you can remove the hazard than you no longer need to find a way to protect the employee

from it. Or you can substitute a different piece of equipment or chemical to use that doesn't pose the same hazard and doesn't create a new one.

1.5.2 Engineering Controls

Engineering controls implement physical change to the workplace, which eliminates/reduces the hazard on the job/task. Examples include:

- Change the process to minimize contact with hazardous chemicals
- Isolate or enclose the process
- Use of wet methods to reduce generation of dusts or other particulates
- General dilution ventilation
- Use of fume hoods

1.5.3 Administrative Controls (Work Practices)

Administrative controls establish efficient processes or procedures to help protect the employee. Examples of these are:

- Rotate job assignments
- Adjust work schedules so that workers are not overexposed to a hazardous chemical

1.5.4 Personal Protective Equipment

The use of PPE to reduce exposure to risk factors is the last line of defense. All other options should be exhausted before use of PPE. Examples of PPE are:

- Chemical protective clothing
- Respiratory protection
- Gloves
- Eye or hearing protection
- Steel toe boots

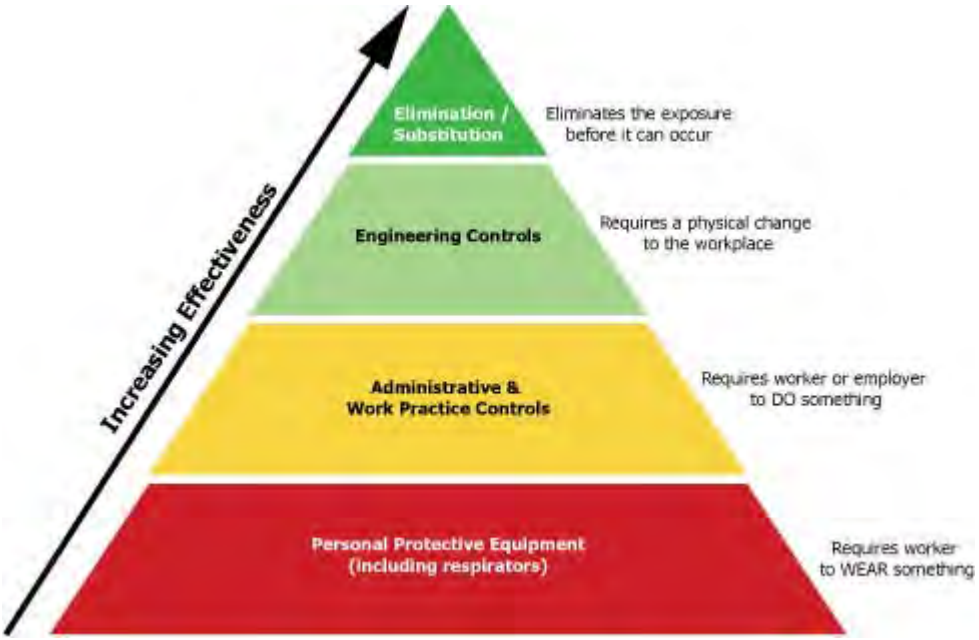


Figure 1: Hazard Mitigation Effectiveness Pyramid

1.5.5 Engineering Controls, Work Practices, and PPE for Substances Regulated in Subparts G and Subpart Z

Engineering controls and work practices will be instituted to reduce and maintain employee exposure at or below the PELs for substances regulated by 29 CFR Part 1910.

Engineering controls that may be feasible include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment. Work practices may include removing non-essential employees from potential exposure during opening of drums, wetting down dusty operations, and positioning employees upwind of potential hazards.

If engineering controls and work practices are not feasible, or not required, a reasonable combination of engineering controls, work practices, and PPE will be used to reduce and maintain at or below the PELs or dose limits for substances regulated by 29 CFR Part 1910, Subpart Z.

GEI will not implement a schedule of employee rotation as a means of compliance with PELs or dose limits except when there is no other feasible way of complying with the airborne or dermal dose limits for ionizing radiation.

The provisions of 29 CFR, subpart G, will be followed.

1.5.6 Engineering Controls, Work Practices, and Personal Protective Equipment for Substances Not Regulated in Subparts G and Subparts Z

An appropriate combination of engineering controls, work practices, and PPE will be used to reduce and maintain employee exposure to or below published exposure levels for hazardous substances and health hazards not regulated by 29 CFR Part 1910, Subparts G and Subparts Z. GEI will use published literature and Safety Data Sheets (SDS) as a guide in making the determination of what level of protection is appropriate for hazardous substances and health hazards for which there is no permissible exposure limit or published exposure limit.

1.5.7 Decontamination Procedures

Decontamination procedures will be developed, communicated to employees, and implemented before employees or equipment enter areas on site where potential for exposure to hazardous substances exists. Procedures will be developed to minimize employee contact with hazardous substances or with equipment that has contacted hazardous substances.

GEI employees leaving a contaminated area will be properly decontaminated; contaminated clothing and equipment leaving a contaminated area will be properly disposed of or decontaminated.

Decontamination procedures will be monitored by the site safety officer (SSO) to determine their effectiveness. When such procedures are found to be ineffective, the site safety officer will contact the Corporate Health and Safety Officer and appropriate steps will be taken to correct deficiencies.

Location

Decontamination will be performed in areas that will minimize the exposure to employees, equipment, and the environment.

Equipment and Solvents

Equipment and solvents used for decontamination will be decontaminated or disposed of properly.

Personal Protective Clothing and Equipment

Protective clothing and equipment will be decontaminated, cleaned, laundered, maintained, or replaced as needed to maintain their effectiveness.

Employees whose clothing comes in contact with hazardous substances will immediately remove that clothing and follow the directions on packaging or SDS sheet for how to properly clean the exposed area. The clothing will be disposed of or decontaminated before it is removed from the work zone.

Commercial Laundries or Cleaning Establishments
Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment will be informed of the potentially harmful effects of exposures to hazardous substances.

Showers and Changing Rooms
Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, these will be provided and meet the requirements of 29 CFR 1910.141 (Sanitation). If temperature conditions prevent the effective use of water, then other effective means for cleansing will be provided and used.

1.6 Injury Reporting

If a GEI employee suffers an injury on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Health and Safety Officer.

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or Supervisor/Project Manager and submitted to the People & Safety Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident Report Form, the Regional Health & Safety Officer (RHSO) will conduct an investigation and evaluation on what happened and how and why it happened. The Corporate Health and Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other appropriate measures to minimize the potential for future injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.7 Limitations

None

1.8 References

OSHA 1910.120 Hazardous Waste Operations and Emergency Response
OSHA 1910 Subpart G Occupational Health and Environment Control
OSHA 1910 Subpart Z Toxic and Hazardous Substances
OSHA 1910.141 General Environmental Controls – Sanitation
http://www.business.govt.nz/worksafe/information-guidance/legal-framework/hsno-act-1996/defining-hazardous-substances/ (Viewed 7/8/2016)
https://www.osha.gov/SLTC/hazardoustoxicsubstances/ (Viewed 7/8/2016)
https://www.osha.gov/SLTC/hazardoustoxicsubstances/control.html (Viewed 7/11/2016)

1.9 Attachments

None

1.10 Contact

Health&SafetyTeam@geiconsultants.com

1.11 Review History

- July 2016
- May 2014
- November 2013
- August 2011 known as Hazard Identification and Management
- February 2011 known as HS-008 Contaminant Properties

STANDARD OPERATING PROCEDURES
SOP No. HS-010 Inclement Weather

1.1 Objective
This Standard Operating Procedure (SOP) is intended for use by employees engaged in work with the potential to be affected by inclement weather. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for working in inclement weather and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Safety page of the GEI intranet.

1.2 General
Employees should be aware of local weather conditions and monitor advisories issued by the National Weather Service and other local reporting services. Depending on location and season, storms are capable of producing heavy rain, floods, extreme temperatures, high wind conditions, lighting, tornados, and/or snowfall.

1.2.1 Heavy Rain
If working or driving in a rain storm, use extreme caution. When driving, turn your low beam lights on when the rainfall becomes heavy. Employees should be aware of the following:

- Heavy rain decreases visibility, especially when driving.
- Surfaces and tools become slippery.
- If you are working in the rain and your clothes become wet there is a risk of hypothermia when exposed to winds, even in warm temperatures.
- If the storms are going to produce thunder and/or lightning, leave the work area immediately and move to a safe area.
- Use your best judgment to determine if the rainfall becomes too heavy to continue working safely.

1.2.2 Lightning
Lightning can strike as far as 10 miles from the area where it is raining. That's approximately the distance you can hear thunder. **If you can hear thunder, you are within striking distance. Seek safe shelter immediately.** This can be within a building or vehicle. Wait 30 minutes after the last clap of thunder or flash of lightning before going outside again.

1.2.3 Flooding

Flooding may occur as a result of heavy rain in a short period of time. Flooding can be particularly acute in canyon areas where dry creek beds can turn into raging rivers from rainfall in distant or higher elevation areas. Be aware of this and your surroundings and move to a safe place if you begin to see signs that flooding may occur. Signs of potential flooding include sudden appearance of water in dry creek beds, increased water flow in rivers or streams, or quick rise in water levels.

Do not attempt to drive through areas or streets that are flooded. Seek alternate routes. Be particularly cautious at night when flooded areas are difficult to see. Urban flooding can stop traffic; increase the potential for traffic accidents; and can trap people in vehicles.

1.2.4 Extreme Temperatures

Work activities may take place in extreme heat or cold. Be prepared if these conditions are anticipated. Have the appropriate personal protective equipment (PPE) available; exercise proper fluid intake; and take breaks to prevent heat and cold stress. For more information about these conditions see the heat stress and cold stress programs found in GEI's Health and Safety Program.

1.2.5 High Winds, Tropical Storms, and Tornados

High Winds can be extremely dangerous. Appropriate measures will be taken to secure equipment and loose items when working in windy conditions. The project manager should be contacted about the weather conditions and, if necessary, work should be postponed.

Tropical storms are described as storms with sustained winds ranging from 39 to 73 miles per hour (mph) and hurricanes produce sustained winds that exceed 74 mph. When winds approach 40 mph (gale force winds) twigs begin to break off of trees and vehicles will veer off of the road. When winds approach 40 mph or the GEI employee feels unsafe based on the activities being performed, stop work and seek shelter as soon as possible. Blowing or falling debris and overhanging limbs/signs can be a significant hazard. If possible, avoid driving in these conditions; 70 percent of injuries during hurricanes are a result of vehicle accidents. Note that tall or elevated equipment will have manufacturer's safe operating wind speeds defined that could be less than 40 mph. The operator's manual should be consulted prior to operation of the equipment.

A tornado is a violent, dangerous, rotating column of air that is in contact with both the surface of the earth and a cumulonimbus cloud or, in rare cases, the base of a cumulus cloud. The Fujita Scale is used to rate the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure. Based on the Fujita Scale, or F-Scale, numbers begin at F0: 40-72 mph and go to F6: 319-379 mph (F6 is

generally theoretical). Nearly three-fourths of tornados are on the weak F0-F1 scale with just over two-thirds of deaths resulting from the violent F4-F5 tornados.

If a tornado is seen, stop work and seek shelter immediately. If a tornado siren is sounded move immediately to safety indoors and then move to a windowless interior space, basement, stairwell, or designated fall-out shelter. Windows should not be opened before an oncoming tornado. If there is no shelter available, seat belt yourself into your stationary vehicle or seek a depression or low spot on the land surface.

1.2.6 Snowfall and Ice Conditions

Working in the winter months may result in activities taking place during periods of snowfall or icy conditions. If you are working during or after snow has fallen, dress appropriately for the conditions. Snow and ice can cause working surfaces to become slippery. Clear snow and ice from work areas to prevent slip hazards. Use caution when performing snow or ice removal activities to prevent injuries. Driving in snowy and icy conditions is also hazardous. Reduce speed and use caution if you must drive in these conditions.

If the weather conditions deteriorate and you do not feel safe working in these conditions, stop work, move to a safe indoor location, and contact your project manager to let them know the weather, work conditions, and your location.

1.3 Injury Reporting

If a GEI employee suffers an injury on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Safety Officer.

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or Supervisor/Project Manager and submitted to the People & Safety Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident Report Form, the Regional Health & Safety Officer (RHSO) will conduct an investigation and evaluation on what happened and how and why it happened. The Corporate Health and Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other appropriate measures to minimize the potential for future injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.4 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection. Protection in extreme weather conditions can best be accomplished if the conditions are anticipated and actions are taken. Monitor local weather conditions prior to starting work.

1.5 References

Center for Disease Control and Prevention – Natural Disasters and Severe Weather
http://www.bt.cdc.gov/disasters/

National Lightning Safety Institute

NOAA, National Weather Service

Office of Climate, Water, and Weather Services

1.6 Attachment

None

1.7 Contact

Safety Team
Health&SafetyTeam@geiconsultants.com

1.8 Review History

- Previous revision dates were not documented
- May 2014
- July 2016

STANDARD OPERATING PROCEDURES

SOP No. HS-012 Noise Exposures

1.1 Objective

This Standard Operating Procedure (SOP) is intended for use by employees engaged in work with elevation noise levels. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for work in loud environments and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Safety page of the GEI intranet.

1.2 General

Working in loud environments can cause hearing damage and loss if the proper protection is not in place. The following procedures describe methods to mitigate unhealthy noise levels and protect hearing.

1.3 Hazard Identification

If projects involve noise levels above OSHA regulations, employees should take steps to remove the noise exposure. Common sources of elevated noise levels are heavy equipment, power tools, pumps, and generators. GEI has an established Hearing Conservation Program located in the GEI Health and Safety Program.

1.4 Risk Identification

Hearing protection is required if noise levels in a work area are known to be above 85 decibels (dB), which can be measured with a noise meter. When decibel levels are not known, hearing protection is required if you need to raise your voice to talk to someone standing within a normal speaking distance from you.

1.5 Mitigation

There are three options that can be used to help mitigate a noise hazard:

1.) Remove the hazard by taking away the source of the noise.

2.) Remove the employee from the source of the noise.

3.) Provide the employee with appropriate personal protective equipment (PPE).

The first option for employee protection is to remove the hazard by taking away the source of the noise or using engineering controls to reduce the level.

If this cannot be accomplished, the next control measure is to remove the employee from the source. This can be done by moving the work area to a quieter location or distancing the employee from the noise source. For example, GEI employees do not need to be standing next to an operating drill rig or other heavy equipment. By distancing themselves from heavy equipment or other noise sources the need for hearing protection can be eliminated/reduced.

The final option, if the above two options aren't feasible, disposable ear plugs that are made available to GEI employees are to be used. Additional means of hearing protection will be provided, such as ear muffs, if the disposable ear plugs are not adequate.

When using hearing protection, employees will need to make a greater effort to be aware of the surroundings which may include moving equipment, traffic, and other site hazards.

1.6 Proper Use of Hearing Protection

DISPOSABLE EAR PLUG FITTING INSTRUCTIONS

Before fitting any ear plugs, make sure your hands are clean.
Foam ear plugs are disposable and not intended for reuse.

Hold the ear plug between your thumb and forefinger. Roll and compress the entire ear plug to a small, crease-free cylinder. While still rolling, use your other hand to reach over your head and pull up and back on your outer ear. This straightens the ear canal, making way for a snug fit.

Insert the ear plug and hold for 20 to 30 seconds. This allows the ear plug to expand and fill your ear canal.

Test the fit. In a noisy environment, and with earplugs inserted, cup both hands over your ears and release. You should not notice a significant difference in the noise level. If the noise seems to lessen when your hands are cupped over your ears, your ear plugs are not fitted properly. Carefully remove the earplugs (see instructions below) and refit following instructions, above.

Always remove ear plugs slowly, twisting them to break the seal. If you remove them too quickly, you could damage your ear drum.	

REUSABLE EAR PLUG FITTING INSTRUCTIONS

Before fitting any ear plugs, make sure your hands are clean.

Reusable ear plugs should be inspected and cleaned often in soapy water. If they become hard, torn, or deformed they should be discarded and replaced.

Reach around your head and pull up and back on your outer ear. This straightens out the ear canal, making way for a snug fit. Hold the stem end of the ear plug and insert it well inside your ear canal until you feel it sealing and the fit is comfortable.	
Test the fit. In a noisy environment, and with ear plugs inserted, cup both hands over your ears and release. You should not notice a significant difference in the noise level. If the noise seems to lessen when your hands are cupped over your ears, your ear plugs are not fitted properly. Carefully remove the ear plugs (see instructions below) and refit following instructions, above.	
Always remove ear plugs slowly, twisting them to break the seal. If you remove them too quickly, you could damage your ear drum.	

1.7 Injury Reporting

If a GEI employee suffers an injury on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Safety Officer.

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or Supervisor/Project Manager and submitted to the People & Safety

Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, People Team, and/or the receipt of the Incident Report Form, the Regional Health & Safety Officer (RHSO) will conduct an investigation and evaluation on what happened and how and why it happened. The Corporate Health and Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other appropriate measures to minimize the potential for future injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.8 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.9 References

OHSA 29 CFR 1910.95 – Occupational Noise Exposure

OHSA 29 CFR 1926.101 – Hearing Protection

Texas American Safety Company (TASCO)

1.10 Attachments

None

1.11 Contact

Health&SafetyTeam@geiconsultants.com

1.12 Review History

- June 2016
- May 2014
- November 2013
- February 2011
- November 2010

STANDARD OPERATING PROCEDURES

SOP No. HS-016 Traffic Hazard Management

1.1 Objective

The objective of this Standard Operating Procedure (SOP) is to prevent or limit the potential for GEI personnel to encounter traffic hazards during field activities.

1.2 General

This SOP is intended for use by employees engaged in work with the potential for traffic hazards. The site-specific health and safety plan (HASP) will include a hazard assessment for the project that identifies the potential for exposure to traffic hazards and the control methods to be implemented by GEI employees, including review or attainment of necessary permits, traffic control plans, and flagger/police detail requirements for the local jurisdiction. Routine checks of the work zone will be made to ensure there are adequate levels of protection. These hazards will be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Safety page of the GEI intranet.

1.3 Traffic Hazard Management

Traffic Hazard Management is the process of identifying and managing the potential risks associated with the movement of traffic through, around, or past a work area. This Traffic Hazard Management SOP is designed to assist employees in identifying and managing these hazards. Work areas should be as safe as possible. It is the responsibility of GEI employees to follow the Traffic Hazard Management SOP and adhere to these safety standards. Safety is not negotiable.

Under no circumstances are GEI employees permitted to commence work in a situation that the employee believes or knows their health and safety, or the health and safety of others, is at risk.

Major risk factors for work site Traffic Hazard Management include:

- The speed of traffic moving through a work site.
- The distance and clearance between moving traffic, workers, vehicles and equipment, and over-head power lines.
- Traffic volume and vehicle composition.
- Nature and conditions at the work site and approaches to the work site.

- Other factors such as the time of day, sight distance, weather, presence of pedestrians, or cyclists, and the type of work being carried out.
- Other hazards in proximity to the work site (e.g., power lines, open excavations) that may have conflicting safety management measures that need to be considered when developing the HASP.

1.4 Site Preparation

The following management measures will be considered whenever working in traffic areas. In addition, remain aware of the amount of traffic around the working area. The work space should be large enough for the job to be completed safely. Check permit, traffic control plans, and flagger/police detail requirements for the local jurisdiction. Perform routine checks of the work zone to make sure there are adequate levels of protection.

1.4.1 Traffic Barriers and Warning Signs

GEI employees will comply with the U.S. Department of Transportation's (DOT) Manual on Uniformed Traffic Control Devices (MUTCD) and/or state regulations for temporary traffic barriers (cones, barriers) and sign placement when required for working in traffic areas. Clearly define the work site by placing traffic barriers around the work space to indicate the space that is needed to safely perform the work. The traffic barrier will help make the work site more visible to other workers, pedestrians, cyclists, and moving vehicles. Place traffic barriers in such a way as to give yourself and equipment adequate space to work within the barriers. OSHA suggests placing the first warning sign at a distance calculated to be 4 to 8 times (in feet) the speed limit (in MPH).

1.4.2 Adequate Light

Requirements for night conditions and work areas with poor visibility are similar to day requirements. However there are a number of additional things to consider, such as visibility of the work site to advancing traffic and sufficient lighting. OSHA requires lighting for workers on foot and equipment operators to be at least 5-foot-candles or greater.

Visibility of the work area can be increased by employing the following measures:

- Using parked vehicles hazard and flashing lights.
- Wearing reflective personal protective equipment (PPE), such as a safety vest, in good condition.
- Providing adequate lighting to illuminate the work area with lights positioned so that there is no glare to approaching drivers.
- Placing reflective advance warning signs and traffic barriers so that they are visible to road users.

1.4.3 Distance from the Nearest Traffic Lane

Work areas located along roadsides will have a minimum clearance as defined by DOT's MUTCD and/or state or local DOT regulations for traffic barrier and sign placement.

1.4.4 PPE

The proper PPE, as outlined in the project HASP, will be worn when appropriate. The color/type of safety vest will comply with site regulations.

1.5 Equipment Operation

Vehicles and heavy equipment operators should use a spotter when possible if it is necessary to drive in reverse to reduce risk of collision with oncoming traffic. If it is necessary to drive against the flow of traffic make sure this area is within the work zone and properly blocked off from oncoming traffic.

1.6 Pedestrian Safety

When working near pedestrian traffic, a safe alternate pedestrian route will be established. Refer to local regulations when establishing pedestrian walkways.

1.7 Injury Reporting

If a GEI employee suffers an injury on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Health & Safety Officer (RHSO).

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or Supervisor/Project Manager and submitted to the People & Safety Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident Report Form, the RHSO will conduct an investigation and evaluation on what happened and how and why it happened. The Corporate Health and Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other appropriate measures to minimize the potential for future injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.8 Limitations

Follow safety procedures as defined in the site-specific HASP, federal DOT, and local jurisdictions. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.9 References

DOT's Manual on Uniformed Traffic Control Devices (2009 Edition)

Hazard Exposure and Risk Assessment Matrix for Hurricane Response and Recovery Work: https://www.osha.gov/SLTC/etools/hurricane/work-zone.html

1.10 Attachments

None

1.11 Contact

Health&SafetyTeam@geiconsultants.com

1.12 Review History

- November 2016
- May 2014
- November 2013
- August 2011
- October 2010 Initially HS-027 Traffic Hazards

STANDARD OPERATING PROCEDURES

SOP No. HS-025 Manual Lifting

1.1 Objective

The purpose of this Standard Operating Procedure (SOP) is to identify and reduce potential work-related musculoskeletal disorder (WMSD) hazards. The SOP is intended to comply with state regulations and safe work practices developed by the Occupational Safety and Health Administration (OSHA). Modifications to meet these requirements will be made to this program as changing laws or regulations dictate.

1.2 General

Lifting heavy items is one of the leading causes of injury in the workplace. Overexertion and cumulative trauma when lifting are significant factors for injuries. When employees use smart lifting practices and work in their "power zone", they are less likely to suffer from back sprains, muscle pulls, wrist/elbow/spinal and other injuries caused by lifting heavy objects. Common things to consider prior to lifting an object are: weight of the object, awkward postures, high-frequency and long duration lifting, inadequate handholds, and physical/environmental factors.

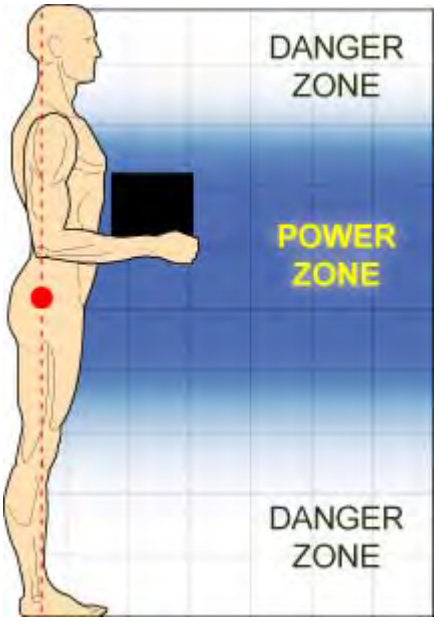


Figure 1: Lifting Power Zone

1.3 Safe Lifting Guidelines

The following safe lifting guidelines will be followed by employees involved in manual lifting activities:

- Before manual lifting is performed, a hazard assessment must be completed. The assessment must consider size, bulk, and weight of the object(s), if mechanical lifting equipment is required, if two-man lift is required, whether vision is obscured while carrying and the walking surface and path where the object is to be carried.
- Get a co-worker to help if equipment or other item is too heavy to lift.
- If possible, use powered equipment instead of manually lifting heavy materials. Lifting equipment such as dollies, hand trucks, lift-assist devices, jacks, or carts can be provided for employees.
- Reduce lifts from shoulder height and from floor height by repositioning the shelf or bin to closer to the power zone.
- Make sure walkways are clear of tripping hazards before moving materials.
- Use your legs and keep your back in a natural position while lifting. Keep the load close to your torso.

- Test the load to be lifted to estimate its weight, size, and bulk and to determine the proper lifting method.
- Do not twist while carrying a load. Instead, shift your feet and take small steps in the direction you want to turn.
- Make sure there are appropriately marked and sufficiently safe clearances for aisles and at loading docks or passageways where mechanical-handling equipment is used.
- Properly stack loose or unboxed materials which might fall from a pile by blocking, interlocking, or limiting the height of the pile to prevent falling hazards.
- Bags, containers, bundles, etc. should be stored in tiers that are stacked, blocked, interlocked, and limited in height so that they are stable and secure to prevent sliding or collapse.

- Storage areas should be kept free from accumulation of materials that could lead to tripping, fire, or explosion.
- Work methods and stations should be designed to minimize the distance between the person and the object being handled.

Supervisors should periodically evaluate work areas and employees' work techniques to assess the potential for and prevention of injuries. New operations should be evaluated to engineer out hazards before work processes are implemented.

1.4 Regulations

OSHA does not have a standard which sets limits on how much a person may lift or carry. They do however state that lifting loads heavier than about 50 pounds will increase the risk of injury.

The National Institute for Occupational Safety and Health (NIOSH) has developed a mathematical model that helps predict the risk of injury based on the weight being lifted and other criteria. The NIOSH model is based on previous medical research into the compressive forces needed to cause damage to bones and ligaments of the back. The mathematical model is incorporated in the *Applications Manual for the Revised NIOSH Lifting Equation*, which can be found on the NIOSH website (http://www.cdc.gov/niosh/docs/94-110/). It should be noted, however, that this NIOSH document provides only voluntary guidelines.

If there is a situation that arises where an employee is required to perform manual lifting on a reoccurring basis, the NIOSH Lifting Equation will be used to determine the appropriate weight that employee can safely lift. The lifting equation establishes a maximum load of 50 pounds for employees that are less likely to have to lift something, and don’t have to do any long distance travel or maneuvering of the item. This 50 pounds is then adjusted to account for:

- how often the employee is lifting
- twisting the back during lifting
- the vertical distance the load is lifted
- the distance of the load from the body
- the distance the employee must move while lifting the load
- how easy it is to hold onto the load

GEI uses 50 pounds as a standard. However each individual should not attempt to carry loads heavier than they can safely manage.

1.5 Training

Training will include general principles of ergonomics, correct manual lifting techniques to avoid musculoskeletal injuries, recognition of hazards and injuries, procedures for reporting hazardous conditions, and methods and procedures for early reporting of injuries.

1.6 Lifting Assistance

If employees are assigned a task that involves repetitive lifting and carrying of equipment the Safety Team and Project Manager should be contacted to conduct an ergonomic evaluation. The task should be discussed to determine if there is an alternative method that can be used. The alternative method should institute an engineering or administrative control to reduce/limit the amount of lifting that is required of the employee. Some examples include providing smaller containers to reduce the weight of what needs to be lifted; providing a device that helps carry awkwardly-shaped objects easier; or using a winch, fork lift, or other device to lift the item(s) for the employee.

1.7 Injury Reporting

Injuries experienced during manual lifting activities should receive prompt medical attention. If a GEI employee suffers an injury on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Health and Safety Officer.

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or Supervisor/Project Manager and submitted to the People & Safety Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident Report Form, the Regional Health & Safety Officer (RHSO) will conduct an investigation and evaluation on what happened and how and why it happened. The Corporate Health & Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other appropriate measures to minimize the potential for future musculoskeletal injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.8 Limitations

Follow safety procedures for manual lifting.

1.9 References

OSHA Technical Manual (OTM), Section VII: Chapter 1 - Back Disorders and Injuries
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=29936 (Viewed 7/12/2016)
https://www.osha.gov/SLTC/etools/electricalcontractors/materials/heavy.html (Viewed 7/12/2016)

1.10 Attachments

None

1.11 Contact

Health&SafetyTeam@geiconsultants.com

1.12 Review History

- July 2016
- August 2014

STANDARD OPERATING PROCEDURES
SOP NO. HS-026 Hazard Identification and Management

1.1 Objective
This Standard Operating Procedure (SOP) is intended to outline the steps GEI employees will take to identify potential hazards on site, the risks associated with these hazards, and the proper engineering controls, work practices, and personal protective equipment (PPE) to use to minimize the associated risks.

1.2 Hazard Identification
Establishing proper work procedures by conducting a job hazard analysis will should be performed for all projects involving field work. An initial identification of hazards will be completed based on past and current property usage of the site, what tasks are required to perform the job, what equipment is needed to complete the assigned tasks, what hazards are in the working area etc.

The site-specific health and safety plan (HASP) will include a hazard assessment for the project that identifies the potential hazards and how to alleviate the hazard. These hazards will be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Safety page of the GEI intranet.

1.3 Risk Assessment
A risk assessment will be performed for all aspects of field work. This analysis is to determine the quantitative or qualitative value of risk related to a tangible situation and a recognized hazard. Identification, studies, and monitoring of any hazard to determine its potential, origin, characteristics, and behavior are examples of what could be included and performed during a risk assessment. The assessment will increase awareness of workplace hazards and provide an opportunity to identify and control workplace hazards.

1.3.1 Assessment Guidelines
It is necessary to consider certain general guidelines for assessing the foot, head, eye and face, and hand hazard situations that exist in an occupational operation or process, and to match the protective devices to the particular hazard.

Assessments should be conducted:

- Prior to starting any work at the site
- As conditions change
- Workplace layout changes
- Environmental changes
- Process changes

- Yearly or other pre-determined interval

1.3.2 Hazard Sources

Some examples of hazard sources include but are not limited to:

- Items, materials, or machinery in motion
- Extreme temperatures
- Chemical exposures
- Harmful dust
- Light radiation
- Falling objects or potential from dropping objects
- Sharp objects
- Rolling or pinching objects
- Layout of workplace and location of co-workers
- Electrical hazards
- Noise exposures
- Confined spaces
- Working near or on water
- Fall hazards
- Traffic or other activities taking place on the site
- Air quality issues

1.4 Prevention – Control Methods

Control methods should be considered in the following hierarchy:

- Elimination
- Substitution
- Engineering Controls
- Administrative Controls
- Personal Protective Equipment

1.4.1 Elimination and Substitution

Elimination and substitution, while most effective at reducing hazards, also tend to be the most difficult to implement in an existing process. If the process is still at the design or development stage, elimination and substitution of hazards may be inexpensive and

simple to implement. For an existing process, major changes in equipment and procedures may be required to eliminate or substitute for a hazard. Employees should work with the Safety Team to find solutions.

1.4.2 Engineering Controls

Engineering controls are used to remove a hazard or place a barrier between the work and the hazard. It's implemented to control the hazard at the source. Examples may include machine guards, sound deading/dampening panels, traffic barriers, guardrails, and shields.

1.4.3 Administrative Controls

Administrative controls change the work procedures such as programs, schedules, and supervision to reduce employee exposure to hazards. The controls are frequently used with existing processes where hazards are not particularly well controlled. Examples of administrative controls are requiring frequent breaks or implementing a specific method to perform a task.

1.4.4 Personal Protective Equipment Selection

To select the proper PPE, the potential hazards must be known. The protective equipment selected must ensure a level of protection *greater than* the minimum required in order to help protect employees. The user must be supplied with a properly fitting protective device and given instructions on care and use. Users must be aware of all warning labels for and limitation of the PPE. Employees must be aware that the PPE does not eliminate the hazard.

1.4.5 Hazard Re-Assessment

As necessary, the workplace should be re-assessed for hazards by identifying and evaluating new equipment and processes, reviewing accident records, and re-evaluating the suitability of previously selected PPE. Re-assessment should occur at a defined regular schedule interval.

1.5 Job Safety Analysis

A job safety analysis (JSA) sometimes referred to as a job hazard analysis (JHA) or an activity hazard analysis (AHA) is the breaking down of any method or procedure into its component parts to determine the hazards connected with each key step and the requirements for performing it safely.

When a JSA is being created, make sure it isn't too general where the resulting information is not enough to assess the hazard and select proper controls, and be careful not to add unnecessary steps.

1.6 Injury Reporting

If a GEI employee suffers an injury on the job that is not life threating, call Medcor Triage at 1-800-775-5866 to speak with a medical professional. Then, immediately report the injury to the Supervisor/Project Manager and Regional Health & Safety Officer (RHSO).

After verbal notification has been made, an Incident Report Form is to be completed by the employee and/or Supervisor/Project Manager and submitted to the People & Safety Team immediately following care of the incident. This form is available on the Safety App (smart phones) and on the Safety page on the GEI intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident Report Form, the RHS) will conduct an investigation and evaluation on what happened and how and why it happened. The Corporate Health and Safety Officer (CHSO) will then recommend (as necessary) engineering controls, personal protection equipment, training or other appropriate measures to minimize the potential for future injuries. The CHSO/RHSO may develop educational information based on lessons learned for distribution to GEI employees.

1.7 Limitations

Limitations may arise on a project specific basis and will be addressed as they arise.

1.8 Attachments

None.

1.9 References

Risk Analytics, LLC Hazard Assessment Training Program, January 2011

1.10 Contact

Health&SafetyTeam@geiconsultants.com

1.11 Review History

- November 2016
- June 2015

Coronavirus COVID-19 Preparedness for Field Work & Project Sites

TO ACCOMPANY PROJECT HASPs and DISCUSS WITH PROJECT TEAMS

Field work will continue to be performed so long as project sites are accessible, and the work can be performed safely. If you have a question about project or site accessibility, ask the GEI project manager and/or client contact about whether there are any access restrictions in place. If your project is suspended, contact your project manager and branch manager to discuss other assignments.

While working in an outdoor environment is better than enclosed areas, the primary precautions we need to continue to take are distancing and good hygiene.

1.0 COVID-19 and Symptoms

DO NOT report to work if you are sick.

- If you experience a fever or symptoms associated with COVID-19 (fever, cough, shortness of breath), stay at home and contact your licensed healthcare provider.
- If you, a household member, or someone you have come into first-hand contact with someone who has a confirmed COVID-19 diagnosis, **DO NOT** come to work.
- If you have tested positive for COVID-19, **DO NOT** come to work even if you are not experiencing any symptoms of illness.

2.0 Reporting

GEI has developed two reporting applications (APPs) for employees to use when reporting COVID-19 symptoms, exposures, or positives tests and for completing daily COVID-19 screening when working in a GEI office or project location. These APPs are available to download to your smartphone (instructions can be found on the GEI COVID-19 Response Page) or can be used from the GEI COVID Response SharePoint and MS Teams platforms.

2.1 COVID-19 Reporting

If you experience COVID-19 related symptoms, have been in close contact with someone with COVID-19 or have tested positive for COVID-19 yourself, complete the COVID-19 Reporting APP after you have contacted your licensed healthcare provider. After submitting information into the reporting app, you will be contacted by a member of the Contact Tracing Team to discuss your situation and provide direction on where to locate appropriate care or testing facilities and discuss return to work timeframes based on the recommendations from the licensed healthcare provider, the continued monitoring of your health, results of COVID-19 tests (if administered), and the information described in Section 3.5. If your project has specific COVID-19 reporting requirements, these will need to be followed in addition to GEI's reporting.

When an employee tests positive for COVID-19 and has been in an office space, deep-cleaning procedures will be triggered.

Employees who have been in direct or indirect contact with and individual who has tested positive for COVID-19 a member of the People Team will be in contact to notify you of the potential exposure and provide guidance.

2.2 Daily Screening/Check In

If you will be working at a GEI office, project location, or another location other than you home you must complete GEI's Daily Check In screening. This is done using the Check In APP and is to be done each day before you enter the work location.

The Check In APP will require you to respond to three screening questions:

- Do you have a cough, shortness of breath or difficulty breathing OR a fever above 100 degrees?
- Do you have any TWO of the following symptoms: chills, repeated shaking with chills, muscle pain, headache, sore throat, or new loss of taste or smell?
- Have you been exposed to, or tested positive for COVID-19?

Answering yes to any of these questions will prompt you to not enter the workplace and contact your healthcare provider. A member of GEI's Contact Tracing Team will contact you following this submission. Answering no to all of these questions will allow you to safely proceed to work.

The APP automatically will check you into the home office location you are assigned. If you are entering a place other than this office, type in the location and click submit.

2.3 Project-Specific Monitoring/Screening

Clients, general contractors, or projects may have screening procedures in addition to those provided in this document. Understand what these are and what you will need to be able to follow them before arriving at the project site and performing work. In addition to understanding these procedures, plan for the additional time that may be needed to meet these requirements.

If you observe a person on a project site showing COVID-19 symptoms, regardless of whether it is the client, a contractor, or a visitor onsite, **immediately** notify the site manager and your project manager/supervisor.

3.0 Distancing & PPE

COVID-19 spreads from person-to-person primarily through droplets that are emitted from the initial person to a distance of 6 feet.

- Maintain a distance of at least ***6 feet (2 meters)*** from others. This includes during site meetings and breaks and while performing work tasks. Meetings should be held outside or by phone/video.
- Minimize the number of employees in one location to the extent possible. Follow local restrictions for maximum number of people congregated in one location at a time.
- If tasks need to be performed close to others (within 6 feet) and that cannot be avoided, wear appropriate PPE including a face mask (surgical or cloth), gloves, and eye protection.

  NOTE: Face masks are not a substitute for distancing. Masks are meant to protect others in case you are infected. Contact the Safety Team (safetyteam@geiconsultants.com) to discuss any special circumstances and the PPE needed.
- Wear nitrile gloves as much as practicable and change them frequently. As practicable, wash your hands or use sanitizer between glove changes. Wash your hands after wearing gloves.
- Minimize and stagger time in office spaces to performing essential duties such as picking up and dropping off equipment and samples. If you need to spend more time in a project office (e.g., a construction trailer), it's important that the workspace allows for proper social distancing.
- When traveling to project sites, travel in separate vehicles. Do not travel in the same vehicle.

4.0 Hygiene Practices

Practice the following:

- Frequent hand washing with soap and warm water for 20 seconds, especially after being in a public place, or after blowing your nose, coughing or sneezing. Bringing containers of water and soap with you is a good solution if it isn't present at the project site. If soap and water are not readily available, use hand sanitizer (containing 60% alcohol) until soap and water can be used.

- Cover coughs or sneezes with a tissue, then dispose of the tissue in the trash and wash hands. Cough/sneeze into your elbow if a tissue is not available.
- Avoid touching your face with your hands.
- Restroom availability may be limited. Many public locations are now closed or do not allow access into buildings. Identify accessible restrooms prior to beginning work. If unavailable, portable restrooms should be considered.
- When filling water bottles (for drinking or hand washing) keep the bottle away from the spigot to avoid transfer of germs or contaminants. Do not share water bottles.
- Wipe down surfaces with disinfectant routinely (at least once per day). This includes field equipment and other items that may have been used by others. This is especially important while working in construction trailers. When using company and personal vehicles, wipe surfaces including the steering wheel, gear shifter, controls, and door handles ***before and after*** use.
- Handshaking, hugging, or other personal contact to greet others is prohibited. Use greeting from a distance such as a wave.
- Avoid sharing field equipment and other materials with others. Before using field equipment or putting it away, wipe it down with disinfectant or wash it with soap and water. Take extra caution using disinfectants while collecting environmental samples to ensure that the samples are not compromised.
- Do not share PPE including personal hand sanitizer dispensers. Use best practices to minimize contact when using publicly shared dispensers.

More detail on ways to protect yourself through distancing and hygiene can be found at MIT Medical's website: https://medical.mit.edu/three-ways-to-protect

5.0 Use of Public Places

- If your project requires you to stay in a hotel, practice the disinfecting precautions described above.
- If you will be eating food/drinks, order take-out or use delivery services at restaurants. Wash your hands before eating.
- Minimize the use of public transportation traveling to and from project sites. Use your personal vehicle (preferred), GEI vehicle, or a ride service such as Lyft.
- If you have concerns, discuss them with the project manager, your supervisor, branch manager, and/or with your Regional Safety Manager (RSM) or with Steve Hawkins, Safety Director.

6.0 Resources

Additional information can be found through the resources below:

- Centers for Disease Control and Prevention (CDC) https://www.cdc.gov/coronavirus/2019-ncov/index.html
- Public Health Agency of Canada https://www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19.html
- Provincial and Local Agency Resources https://www.ontario.ca/page/2019-novel-coronavirus#section-0
- World Health Organization https://www.who.int/emergencies/diseases/novel-coronavirus-2019

7.0 Notifications and Concerns

The precautions included in this guidance and in other GEI's employee communications should be practiced at all project site locations and offices. While COVID-19 related information is not expected to be reported through GEI's incident reporting process, the expectation is that all employees will communicate any inconsistencies or concerns with practices at project sites to their project manager, supervisor, branch manager, and RSM. This will allow us to make corrections/updates and provide proper protective measures.

Information about preventing COVID-19 exposure is changing regularly. The information included in this guide are general steps we can take while performing field assignments and should be included in HASPs and safety briefings. If you have specific situations, questions, or concerns please discuss them with the Project Manager, your RSM, or Steve Hawkins.

APPENDIX H

Site Management Form

Site Inspection Form
37-24 & 37-28 30th Street Redevelopment Site
NYSDEC BCP Site Number: C241214

General Information			
Project Name	**37-24 & 37-28 30th Street Redevelopment Site**		
BCP Site No.	**C241214**	Location	**37-24 & 37-28 30th Street, Long Island City, NY 11101**
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present state of site			
Type of Inspection: ❑ Regular ❑ Other			
Weather Information			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			

Overall Site Issues

	Activity	Corrective Action Needed and Notes
1	Are the monitoring wells and surrounding sidewalk in good condition?	
2	Inspect site records and confirm that they are up to date as necessary (e.g., Site Inspection Forms, sampling logs, etc.)	
3	Is the site usage in compliance with the institutional controls?	
4	Is there evidence of past invasive construction or excavation activity on site?	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature:__ _____ Date:_____

37-24 and 37-28 30th Street SSDS System

Log Sheet

Preformed By:	Outside Temperature:	
Date:	Outside Weather:	
Time:		Comments
SSDS Blower System		
Any Active Alarms:	Y / N	
SSDS Control Panel Switches on Auto:	Y / N	
Flow (SCFM):		
Influent Air Vaccum (InWC):		
Effluent Air Pressure (InWC):		
Effluent PID (ppm):		
SSDS Monitoring Points		
Monitoring Point	Vaccum Reading (InWC)	
1		
2		
3		
4		
5		
6		
7		
8		
Comments:		

InWC: Inch of Water

PID: Photoionization Detector

ppm: parts per million

SSDS: Sub-slab Depressurization System

37-24 and 37-28 30th Street
Long Island City, New York
NYSDEC BCP Site No. C24124
Soil Vapor Intrusion Sampling Log
Site Management Plan

Soil Vapor Intrusion Sample Log												
Sample ID	Start					Finish						
	Time (Start)	Pressure (in Hg)	PID (ppm)	Helium (line)	Helium (Atmos)	Time (Finish)	Pressure (in Hg)	PID (ppm)	Helium (line)	Summa Can ID	Flow Reg. ID	Notes
Sub-Slab Vapor												
Indoor Air												
Outdoor Air												

Groundwater Sampling Log

Client: _____ **Project Number:** _____

Site Location: _____

Well No: _____ Weather: _____

Date: _____ Purge Water Disposal: _____

Sampled By: _____ Well Diameter / Type: _____

Depth of Well (ft): _____ Water Column (ft): _____

Depth to Water(ft): _____ Volume of Water in Well (gal) _____

Depth to Product (ft): _____ Volume of Water to Remove (gal): _____

well diameter:	1 in	2 in	4 in	6 in	8 in
gallons per foot:	0.041	0.163	0.653	1.469	2.611

Start Purging: _____ Purge Rate: _____

End Purging: _____ Volume of Water Removed (gal): _____

Method of Purge: _____ Method of Sampling: _____

Physical Appearance/ Comments: _____

Samples Collected: (analyses / no. bottles) _____

Sample Time: _____ Laboratory : _____

Duplicate Sample/Time: _____

Time	**DTW** ft	**Flow Rate** ml/min	**ORP** mV (+/- 10 mV)	**Conductivity** **mS/cm** **(w/in 3%)**	**Turbidity** NTU (w/in %10)	**pH** SU (+/- 0.1)	**Temperature** **C°** **(w/in 3%)**	**Dissolved O_2** mg/L (w/in 10%)
End of Parameter Measurements								

APPENDIX I

Community Air Monitoring Plan

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.

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