350 RISING

350 GRAND CONCOURSE
BRONX, NEW YORK

Remedial Investigation Work Plan

NYSDEC BCP Site #: C203153
AKRF Project Number: 210258

Prepared For:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau B
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Prepared On Behalf Of:

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1.0 INTRODUCTION

This Remedial Investigation (RI) Work Plan (RIWP) has been prepared by AKRF, Inc. (AKRF) on behalf of 350 Rising LLC (the Requestor) for the property located at 350 Grand Concourse in the Bronx, New York (the Site). The Site is identified on the New York City Tax Map as Bronx Borough Tax Block 2341, Lot 42. Historically, Lot 42 was divided into Lots 42 and 47; Lot 47 is associated with the historical address 370 Grand Concourse, Bronx, NY.

The Site includes an approximately 31,045-square-foot (sf) concrete-paved vacant gasoline service station with a boarded up one-story convenience store, a former sales kiosk, and a canopy covered former gasoline pump dispenser area. All pump dispensers have been removed. The Site is bounded to the north by a three-story residential building and a five-story apartment building, followed by East 144th Street; to the east by a wooded vacant lot, followed by Metro North Railroad tracks; to the south by a multi-story hotel, followed by various automotive repair shops; and to the west by Grand Concourse, followed by a U-Haul Storage and Moving facility. The surrounding area consists primarily of automotive, commercial, transit, and residential uses. A Site Location map is provided as Figure 1, and a Site Plan is provided as Figure 2.

This RIWP is being submitted concurrently with a New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Application (BCP Site No. C203153) and an Interim Remedial Measures (IRM) Work Plan. The Requestor plans to enter the NYSDEC BCP as a Volunteer. An October 2021 Subsurface (Phase II) Investigation Report prepared for the Site by AKRF concluded that there are elevated concentrations of petroleum volatile organic compounds (VOCs), metals, and polycyclic aromatic hydrocarbons (PAHs) in soil, VOCs and metals in groundwater, and petroleum- and chlorinated solvent-related compounds in soil vapor at the Site. The RI—in conjunction with an IRM to remove the pump islands, canopy, convenience store, underground storage tanks (USTs), and associated piping, vents, and fill ports—will consist of the collection of soil, groundwater, and soil vapor samples to define the nature and extent of contamination in on-site soil, groundwater, and soil vapor.

This RIWP describes the procedures to be used to define the nature and extent of contamination at the Site. The data compiled from the RI described in this RIWP, the October 2021 Subsurface (Phase II) Investigation Report, and the IRM will be used to prepare an RI Report (RIR). All work will be completed in accordance with this RIWP, which includes a Quality Assurance Project Plan (QAPP) (Appendix A) and a Health and Safety Plan (HASP) (Appendix B). The Community Air Monitoring Plan (CAMP) detailed in the HASP will be implemented during all subsurface disturbance activities at the Site, including but not limited to soil boring advancement, well installation, soil and groundwater sampling, and backfilling of boreholes.

Contact information for the parties responsible for the work described in this RIWP is included in In-Text Table 1:

In-Text Table 1
Remedial Investigation Personnel Contact Information

Company	Individual Name	Title	Contact Number
NYSDEC	Steven Walsh	Project Manager	518-402-9824 (office)
AKRF	Deborah Shapiro, QEP	Quality Assurance/ Quality Control (QA/QC) Officer	646-388-9544 (office)
	Scott Caporizzo	Project Manager	914-922-2354 (office)
	Greg Baird	Deputy Project Manager	914-922-2372 (office)
	Claire Bearden	Field Team Leader/ Site Safety Officer (SSO)	336-266-9330 (cell)
350 Rising LLC	Peter Fine	Client Representative	212-620-0500 (office)

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description and Surrounding Land Use

The Site includes an approximately 31,045-sf concrete-paved vacant gasoline service station with a boarded up one-story convenience store, a former sales kiosk, and a canopy covered former gasoline pump dispenser area. All pump dispensers have been removed. The Site is bounded to the north by a three-story residential building and a five-story apartment building, followed by East 144th Street; to the east by a wooded vacant lot, followed by Metro North Railroad tracks; to the south by a multi-story hotel, followed by various automotive repair shops; and to the west by Grand Concourse, followed by a U-Haul Storage and Moving facility. The surrounding area consists primarily of automotive, commercial, transit, and residential uses. Sensitive receptors located within a ½-mile radius of the Site include residences, daycares, parks and playgrounds, and K-12 schools. Daycares, parks and playgrounds, and K-12 schools within a ½-mile radius include the following:

Daycares

Hostos Community College Children's Center, Inc. 475 Grand Concourse Bronx, NY 10451 (718) 518-6554 Distance: 900 feet north of the Site	Sunshine Learning Center 253 E. 142nd Street Bronx, NY 10451 (718) 679-9800 Distance: 900 feet east of the Site
Creciendo Daycare 281 E. 143rd Street, Apartment 12F Bronx, NY 10451 (347) 594-4040 Distance: 1,200 feet east of the Site	Cuddly Bundles Childcare 137 E. 150th Street Bronx, NY 10451 (718) 402-4801 Distance: 1,400 feet northwest of the Site
Shiloh Garden Daycare 314 E. 143rd Street, Apartment 3B Bronx, NY 10451 (646) 762-5145 Distance: 1,450 feet southeast of the Site	

Parks/Playgrounds

Eelina Antonetty Playground East 146th Street & Walton Ave Bronx, NY 10451 Distance: 1,056 feet north-northwest of the Site

Schools

Community School for Social Justice 350 Gerard Avenue Bronx, NY 10451 (718) 402-8481 Mr. Jaime Guzman, Principal Distance: 475 feet west of the Site	Health Opportunities High School 350 Gerard Avenue Bronx, NY 10451 (718) 401-1826 Mr. Andrew Clayman, Principal Distance: 475 feet west of the Site
Family Life Academy Charter School III 370 Gerard Avenue Bronx, NY 10451 (718) 588-0679 Ms. Andrea Hernandez, Principal Distance: 480 feet west of the Site	KIPP NYC College Prep High School 201 E. 144th Street Bronx, NY 10451 (212) 991-2626 Ms. Monica Samuels, Principal Distance: 500 feet northeast of the Site
Intermediate School 224 339 Morris Avenue Bronx, NY 10451 (718) 401-4891 Ms. Amy Schless, Principal Distance: 950 feet east of the Site	Success Academy Charter School Bronx 1 339 Morris Avenue Bronx, NY 10451 (347) 286-7950 Ms. Elizabeth Miller, Principal Distance: 950 feet east of the Site
KIPP Elements Primary School 501 Gerard Avenue Bronx, NY 10451 (929) 288-4740 Ms. Diamond Graham, Principal Distance: 1,100 feet northwest of the Site	Public School 18 502 Morris Avenue Bronx, NY 10451 (718) 292-2868 Ms. Lauren Sewell Walker, Principal Distance: 1,500 feet northeast of the Site

A map showing surrounding land usage and sensitive receptor populations is provided as Figure 3.

2.2 Site Geology, Hydrogeology, and Subsurface Characteristics

Surface topography at the Site and in the immediate surrounding area is generally level. Based on the U.S. Geological Survey (USGS), Central Park NY-NJ Quadrangle (2013) map, the Site lies at an elevation of approximately 40 feet above mean sea level, with surrounding area topography sloping to the southwest.

Based on AKRF's October 2021 Subsurface (Phase II) Investigation Report, subsurface materials consist of 7 to 17 feet of historic fill (silt with sand, brick, gravel, asphalt and glass) generally underlain by either apparent native soil (silt, sand, and clay with gravel) to the terminus of the borings [between 13 and 25 feet below grade (bg)] or apparent weathered bedrock encountered between 7 and 20 feet bg. Strong petroleum-like odors and elevated photoionization detector (PID) readings ranging from 0.2 parts per million (ppm) to 15,000 ppm (the maximum reading of the PID instrument) were noted in borings SB-02, SB-03, SB-13, and SB-14 at depths ranging from 9 to 21 feet bg and in SB-15 at a depth of 4 to 5 feet bg. Borings SB-02, SB-03, SB-13, and SB-14 were located in the west-central and southern portion of the Site. Boring SB-15 was located west of the former tank field in the northeastern portion of the Site.

Groundwater was measured between approximately 12 and 18 feet bg during the Subsurface (Phase II) Investigation and likely flows in a southwesterly direction toward the Bronx River, approximately 0.6 mile southwest of the Site. However, actual groundwater flow direction in the

Bronx is difficult to ascertain without measurements from on-site wells and can be affected by many factors, including subsurface openings or obstructions such as basements, utilities, bedrock geology, subways, and various other factors. There are no surface water bodies or streams on or immediately adjacent to the Site. There are no public or private drinking water supply wells within a ½-mile radius of the Site.

2.3 Proposed Redevelopment Plan

The proposed project is named 350 Rising. The proposed redevelopment plan includes demolition of the existing convenience store, pump islands, canopy, and kiosk and construction of a new charter school.

2.4 Site History

Historical records indicated that as early as 1891, the Site was developed with several two- to four-story dwellings and from 1908 to 1935, the southern portion of the Site was depicted as the NYC and HR Railroad Co. with multiple two- to four-story structures. By 1935, the Site was occupied by automotive related businesses/facilities and uses that included various gasoline filling stations, auto sales, and auto body repair with associated gasoline USTs between 1944 and 2021.

3.0 PREVIOUS INVESTIGATIONS

Phase I Environmental Site Assessment – 350 and 370 Grand Concourse, Bronx, New York, AKRF, October 2021

AKRF prepared a Phase I Environmental Site Assessment (ESA) Report for the Site in October 2021 in accordance with American Society for Testing and Materials (ASTM) Standard E1527-13, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Practice*. No Historic Recognized Environmental Conditions (RECs) or Controlled RECs were identified. The report identified the following RECs:

Recognized Environmental Conditions (RECs)

- At the time of the reconnaissance, the Site was observed to be a former gasoline service station. Petroleum bulk storage (PBS) was observed at the Site, including three 12,000-gallon gasoline USTs within a tank field in the southeast corner of the Site, two minimally filled 55-gallon drums of a gasoline/water mixture in the rear yard of the convenience store, and nine gasoline pump dispenser islands in the center of the Site. Petroleum-like staining was observed on and around each of the gasoline pump dispenser islands and within the tank field area. Multiple monitoring wells and potential soil vapor extraction (SVE) wells were observed throughout the Site, most of which were in damaged or decommissioned condition. Two out-of-service SVE vaults with associated gauges and hoses were observed near the eastern Site line. An unidentified drywell with an unknown discharge point was observed in the northwest corner of the Site behind the convenience store.
- The Site was identified on historical Sanborn maps, city directories, local records, and in the following databases for current and former operations, including various automotive services/repair as well as petroleum storage/filling: NYSDEC Petroleum Spills, Resource Conservation and Recovery Act (RCRA) Generator/Transporter, NYSDEC PBS, and the EDR Historic Auto Station. According to the database, two open NYSDEC Spill Nos. (98-14075 and 01-11974) are associated with the Site and remain open.
- A review of the historical city directories, Sanborn maps, and regulatory databases identified numerous automotive, commercial, and dry cleaning/laundry uses on adjacent and surrounding blocks as early as 1891.

In addition, the following Business Environmental Risks [items outside the scope of E1527-13 like asbestos containing materials (ACM), lead-based paint (LBP) and/or polychlorinated biphenyls (PCBs) in building materials or fill/debris] were identified:

- Suspect ACM were observed at the Site. Suspect ACM were noted to be in generally good to damaged condition. ACM may also be present in demolition debris in the subsurface at the Site.
- Based on the existing building’s age, PCBs may be contained in fluorescent lighting fixtures, electrical equipment, and caulking. No evidence of leaks or stains from these fixtures and equipment was observed.
- Based on the age of the building, LBP may be present on outdoor surfaces at the Site. Painted surfaces were observed to be in generally fair to good condition. LBP may also be present in demolition debris in the subsurface at the Site.
- The Site has been assigned an E-Designation for Hazardous Materials, Air Quality, and Noise (E-442).

Based on the RECs identified, a Subsurface (Phase II) Investigation was recommended.

Subsurface (Phase II) Investigation Report – 350 and 370 Grand Concourse, Bronx, New York, AKRF, October 2021

AKRF prepared a Subsurface (Phase II) Investigation Report for the Site in October 2021. The investigation was conducted to determine whether current and/or former on-site or off-site activities had adversely affected the Site's subsurface. The investigation included: a geophysical investigation followed by the advancement of 14 borings (with continuous soil core collection and field screening), 8 of which were retrofitted as permanent groundwater monitoring wells, and installation of 9 soil vapor points, with the collection and laboratory analysis of 28 soil, 6 groundwater, and 9 soil vapor samples. Groundwater was reportedly encountered between approximately 12 and 18 feet bg.

Subsurface materials consisted of 7 to 17 feet of historic fill (silt with sand, brick, and gravel) generally underlain by either apparent native soil (silt, sand, and clay with gravel) to the terminus of the borings (between 13 and 25 feet bg) or apparent weathered bedrock encountered between 7 and 20 feet bg. Strong petroleum-like odors and elevated PID readings ranging from 0.2 ppm to 15,000 ppm (the maximum reading of the PID instrument) were noted in borings SB-02, SB-03, SB-13, and SB-14 at depths ranging from 9 to 21 feet bg and in SB-15 at a depth of 4 to 5 feet bg. Borings SB-02, SB-03, SB-13, and SB-14 were located in the west-central and southern portion of the Site downgradient of the current pump islands and USTs. Boring SB-15 was located west of the former tank field in the northeastern portion of the Site.

Soil sample analytical results were compared to NYSDEC 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and Restricted Residential Soil Cleanup Objectives (RRSCOs), and per- and polyfluoroalkyl substances (PFAS) results were compared to NYSDEC Sampling, Analysis, and Assessment of PFAS guidance (dated January 2021) Unrestricted Use Guidance Values (UUGVs) and Restricted Residential Guidance Values (RRGVs).VOCs were additionally compared to Protection of Groundwater Soil Cleanup Objectives (PGWSCOs). Groundwater analytical results were compared to NYSDEC Technical and Operational Guidance Series (1.1.1): Class GA Ambient Water Quality Standards and Guidance Values (AWQSGVs), and PFAS results were compared to the NYSDEC Screening Levels. There are currently no published guidelines for soil vapor; therefore, soil vapor data is presented without comparative standards.

A summary of the analytical results is as follows:

Soil

- Concentrations of one or more VOCs, specifically petroleum-related VOCs, exceeded their respective UUSCOs and PGWSCOs, but not their RRSCOs, in four of the soil samples collected. The VOCs are most likely attributable to the current and former usage of the Site as a gasoline station and auto repair.
- Two SVOCs [dibenz(a,h)anthracene and indeno(1,2,3-c,d)pyrene] exceeded their respective RRSCOs in sample SB-10. These SVOCs are PAHs, a class of compounds commonly found in ash, asphalt, and petroleum products, and may be attributable to the historic fill material encountered in the soil boring at the corresponding depth, or may be associated with the open NYSDEC petroleum spills.
- Barium, copper, and lead were detected at concentrations above their respective RRSCOs in three soil samples analyzed from within the historic fill layer. Elevated concentrations of other metals (hexavalent chromium, nickel, mercury, and zinc) were detected above the UUSCOs, but below the RRSCOs, in multiple soil samples analyzed from across the Site. These findings are most likely attributable to the historic fill material observed in the borings at corresponding depths; however, the possibility exists that the elevated metals could be associated with former usage of leaded-gasoline and/or former auto repair.

- Two PCBs (Aroclor 1248 and 1254) were detected in two samples at concentrations above the UUSCO for total PCBs, but below the RRSCO. The detected PCBs are likely attributable to historic fill material but may also be related to former auto repair usage.
- Three pesticides (4,4'-DDE, 4,4'-DDT, and dieldrin) were detected in samples above the UUSCOs, but below the RRSCOs. The detected pesticides are likely attributable to historic fill material, which was observed in each of the soil borings.
- Perfluorooctane sulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) were detected at concentrations above the UUGVs, but below the RRGVs, in one or more soil samples collected from the top two feet bg.

Groundwater

- Petroleum-related VOCs were detected above AWQSGVs in four groundwater samples located in the west-central and southern portions of the Site, downgradient of the pump islands and current tank field.
- Two SVOCs (2,4-dimethylphenol and naphthalene) were detected above AWQSGVs in two groundwater samples located in the west-central and southern portions of the Site, downgradient of the pump islands and current tank field.
- Unfiltered (total) metals including iron, magnesium, manganese, and sodium were detected above AWQSGVs in multiple groundwater samples, whereas the filtered (dissolved) sample exceedances were limited to magnesium, manganese, and sodium. The exceedances were likely indicative of natural conditions or representative of regional conditions.
- No PCBs or pesticides were detected in any of the groundwater samples collected.
- PFOS, PFOA, and Perfluorobutyrate (PFBA) were detected at concentrations above the NYSDEC Screening Levels in one or more groundwater samples. 1,4-Dioxane (1,4-Dx), which has no current standard or guidance value, was only detected in MW-14 at an estimated concentration of 0.11 micrograms per liter (µg/L).

Soil Vapor

Concentrations of petroleum-related and solvent-related compounds were identified in the soil vapor samples collected across the Site. The petroleum-related VOCs [concentrations up to 83,000 micrograms per meter cubed (µg/m^3) from a diluted analysis for 2,2,4-trimethylpentane] are likely associated with the current and former usage of the Site as a gasoline station and auto repair.

Figures showing Subsurface (Phase II) Investigation soil sample concentrations detected above UUSCOs, RRSCOs, and/or PGWSCOs, groundwater sample concentrations detected above AWQSGVs and/or PFAS Screening Levels, and soil vapor detections are provided as Figures 4, 5, and 6, respectively. A groundwater elevation contour map is provided as Figure 7.

3.1 Areas of Concern (AOCs)

Based on the Site's history and the previous reports prepared for the Site, the AOCs for the RI include:

1. The former gasoline pumps and USTs (current and former) associated with former gasoline station operations and petroleum bulk storage (PBS).
2. Petroleum contaminated soil and groundwater associated with NYSDEC Spill Nos. 98-14075 and 01-11974.
3. The former usage of the Site for auto repair.

4. The elevated concentrations of VOCs, SVOCs and metals in soil/fill across the Site, elevated concentrations of VOCs in groundwater on the western portion of the Site, and elevated concentrations of petroleum- and chlorinated solvent-related VOCs in soil vapor on the southern and western portions of the Site identified during AKRF's October 2021 Subsurface (Phase II) Investigation.

4.0 FIELD PROGRAM

The RI field program will focus on collecting soil, groundwater, and soil vapor data to further define the nature and extent of Site contamination and to assist with determining the appropriate remedial action.

4.1 Field Program Summary

A geophysical survey was conducted as part of the Phase II. However, due to the presence of USTs, numerous utilities, and gasoline product lines, a second geophysical survey will be conducted across all accessible portions of the Site to refresh markouts indicating the presence of potential USTs and underground utilities, and to clear the proposed sampling locations. The field sampling scope of work will consist of the following: the advancement of 14 soil borings with continuous sample collection and laboratory analysis of 2 soil samples from each boring; the installation of 5 permanent groundwater monitoring wells with the collection and laboratory analysis of 5 groundwater samples; and the installation of 6 temporary soil vapor points with the collection and laboratory analysis of 6 soil vapor samples. The proposed sample locations are shown on Figure 8.

The soil boring and temporary soil vapor point locations will be surveyed using a Global Positioning System (GPS) and will be measured off of fixed points in the field. The groundwater monitoring wells will be surveyed by a New York State-licensed surveyor. Any field evidence of contamination (visual, olfactory, or elevated PID readings) will be recorded. All sampling equipment (e.g., drilling rods and casing, macrocore samplers, and probe rods) will be either dedicated or decontaminated between sampling locations.

The scope of work will be conducted by AKRF and its subcontractors. Qualifications for AKRF personnel are included in Section 2.0 of Appendix A. The following sections describe the methods that will be used to complete the aforementioned scope of work.

4.2 Geophysical Survey

The geophysical survey will include ground-penetrating radar (GPR) and magnetometry. GPR uses electromagnetic wave propagation and scattering to image and identify changes in electrical and magnetic properties in the ground. Magnetometers measure irregularities in the magnetic field in a given area. Any anomalies indicative of UST(s) will be marked in the field and surveyed using a GPS.

4.3 Soil Boring Installation and Soil Sampling

A Rotosonic drill rig will be used to advance soil borings RI-SB-16 through RI-SB-18, RI-SB-21 through RI-SB-23, and RI-SB-25 through RI-SB-29. A remote access Geoprobe™ direct-push drill rig will be used to advance soil borings RI-SB-19, RI-SB-20 and RI-SB-24 at the approximate locations shown on Figure 8. For soil borings drilled using a Geoprobe™, soil cores will be collected in four-foot-long, two-inch-diameter, stainless steel macrocore piston rod samplers fitted with internal, dedicated acetate liners. For soil borings drilled using a Rotosonic drill rig, soil cores will be collected in four-foot-long, four-inch-diameter, dedicated plastic liners. Soil samples will be collected continuously from grade to the groundwater interface, expected to be encountered between 12- and 18-feet bg. The soil samples will be inspected by AKRF field personnel for evidence of contamination (e.g., odors, staining, etc.), screened for the presence of VOCs with an 11.7 electron Volt (eV) lamp PID, and logged using the modified Burmister soil classification system. The PID will be calibrated at the beginning of each work shift and on an as-needed basis in accordance with manufacturer's specifications.

Soil samples will be submitted for laboratory analysis based on field observations and PID readings. It is anticipated that one to three soil samples will be submitted for laboratory analysis, depending upon the sample location. At a minimum, where possible, the soil samples from the two-foot interval immediately below the surface (asphalt, concrete, and/or vegetation) and the two-foot interval immediately above the groundwater interface will be submitted for laboratory analysis. A third soil sample will be submitted for laboratory analysis from the interval displaying the greatest evidence of contamination, if encountered. At each of the proposed soil boring locations, additional samples will be collected for laboratory analysis if soil exhibits evidence of contamination (elevated PID readings, odors, staining, etc.).

Soil samples slated for laboratory analysis will be labeled, placed in laboratory-supplied containers, and shipped to the laboratory via a courier with a chain of custody (COC) in accordance with appropriate United States Environmental Protection Agency (EPA) protocols to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory.

Soil samples collected from the soil borings will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, PCBs by EPA Method 8082, pesticides by EPA Method 8081, Target Analyte List (TAL) metals by EPA Method 6000/7000 series, and hexavalent chromium by EPA Method 7196A. Soil samples will be additionally analyzed for PFAS by Modified EPA Method 537.1 and 1,4-Dx by EPA Method 8270. Soil samples collected immediately above the water table will be analyzed for VOCs by EPA Method 8260 only. Category B deliverables will be requested from the laboratory.

After each boring is completed, the boreholes will be filled with on-site materials to 24 inches below the surface (if not noticeably contaminated) and patched with asphalt or concrete to match existing surface conditions in accordance with Section 3.3(e) of DER-10. Soil cuttings to be managed will be containerized in properly labeled Department of Transportation (DOT)-approved 55-gallon drums for future off-site disposal at a permitted facility. Boreholes that require drill cutting disposal will be filled with bentonite chips (hydrated). Disposable sampling equipment that comes into contact with environmental media will be double bagged and disposed of as municipal trash.

The rationale for the proposed soil sample locations is summarized in In-Text Table 2.

In-Text Table 2
Proposed Soil Sample Rationale

Soil Boring ID	On-Site Location	Analytical Parameters	Rationale
RI-SB-16	Southwestern	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the southwestern portion of the Site
RI-SB-17	Western	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the western portion of the Site
RI-SB-18	Western	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the western portion of the Site
RI-SB-19	Northwestern	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the northwestern portion of the Site

In-Text Table 2
Proposed Soil Sample Rationale

Soil Boring ID	On-Site Location	Analytical Parameters	Rationale
RI-SB-20	Northern	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the northern portion of the Site
RI-SB-21	Eastern	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the eastern portion of the Site
RI-SB-22	Central	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the central portion of the Site in the vicinity of the pump islands
RI-SB-23	Central	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the central portion of the Site in the vicinity of the pump islands
RI-SB-24	Northeastern	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the northeastern portion of the Site
RI-SB-25	Eastern	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the eastern portion of the Site
RI-SB-26	Eastern	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the eastern portion of the Site
RI-SB-27	Central	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the central portion of the Site in the vicinity of the pump islands
RI-SB-28	Central	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the central portion of the Site in the vicinity of the pump islands
RI-SB-29	South-central	VOCs, SVOCs, PCBs, pesticides, PFAS, 1,4-Dx, TAL metals, and hexavalent chromium	To further delineate the nature and extent of contamination in the south-central portion of the Site, downgradient of the USTs

Notes:
QA/QC sampling is discussed in Section 4.8.

4.4 Groundwater Monitoring Well Installation and Development

Five permanent monitoring wells (denoted as RI-MW-18, RI-MW-21 through RI-MW-23, and RI-MW-31) will be installed using a Rotosonic drill rig at the proposed locations shown on Figure 8. The wells will be constructed with 10 feet of 2-inch-diameter 0.002-inch slotted polyvinyl chloride (PVC) well screen straddling the water table, which is expected to be encountered between approximately 12- and 18-feet bg. The wells will be constructed with a 2-inch-diameter solid PVC riser installed to the ground surface. A No. 2 morie sandpack will be installed two feet above the well screen. The annular space around the solid well riser will be sealed with approximately two feet of bentonite and a non-shrinking grout/cement mixture to approximately one foot bg. Each of the wells will be finished with a locking j-plug and flush-mounted protective locking well cover. Well construction logs will be prepared and included as an appendix to the RIR.

Following installation, each groundwater monitoring well will be developed via pumping and surging to remove any accumulated fines and establish a hydraulic connection with the surrounding aquifer. Development will continue until turbidity within the well is less than 50 nephelometric turbidity units (NTUs) for three successive readings and until water quality indicators have stabilized to within 10% for pH, temperature, and specific conductivity for three successive readings. In the event that 50 NTUs cannot be achieved, at least three well volumes will be purged from the well. Well development details will be noted on groundwater development logs, included as an appendix to the RIR.

The rationale for the proposed groundwater sample locations is summarized in In-Text Table 3.

In-Text Table 3
Proposed Groundwater Sample Rationale

Groundwater Monitoring Well ID	On-Site Location	Analytical Parameters	Rationale
RI-MW-18	Western	VOCs, SVOCs, PCBs, pesticides, total and dissolved TAL metals, 1,4-Dx, and PFAS	To further delineate the extent of petroleum contamination in the western portion of the Site and further define Site-specific groundwater flow direction and elevation
RI-MW-21	Eastern	VOCs, SVOCs, PCBs, pesticides, total and dissolved TAL metals, 1,4-Dx, and PFAS	To further delineate the extent of petroleum contamination in the eastern portion of the Site and further define Site-specific groundwater flow direction and elevation
RI-MW-22	Central	VOCs, SVOCs, PCBs, pesticides, total and dissolved TAL metals, 1,4-Dx, and PFAS	To assess groundwater quality beneath the former pump islands and further define Site-specific groundwater flow direction and elevation
RI-MW-23	Central	VOCs, SVOCs, PCBs, pesticides, total and dissolved TAL metals, 1,4-Dx, and PFAS	To assess groundwater quality beneath the former pump islands and further define Site-specific groundwater flow direction and elevation
RI-MW-31	Northeastern	VOCs, SVOCs, PCBs, pesticides, total and dissolved TAL metals, 1,4-Dx, and PFAS	To assess groundwater quality beneath the former (5) 4,000-gallon USTs and further define Site-specific groundwater flow direction and elevation

Notes:
QA/QC sampling is discussed in Section 4.8.

4.5 Groundwater Elevation Survey

The monitoring wells will be surveyed by a New York State-licensed surveyor to determine their accurate location and elevation. Two elevation measurements will be taken at each well location—the at-grade elevation and the elevation of the top of PVC casing (north side at marking)—to facilitate preparation of a groundwater contour map and to determine the direction of groundwater flow. The elevation datum for the sampling points will be based on the North American Vertical Datum of 1988 (NAVD 88), with the horizontal datum being based on NYS

Plane Coordinates Long Island Zone. The groundwater elevation survey will be included as an appendix to the RIR.

4.6 Groundwater Sampling

In accordance with EPA low-flow sampling protocols, the wells will be sampled one to two weeks following their development. Prior to sampling, an electronic interface meter will be used to measure water levels and thickness of separate phase product, if any. To evaluate contaminant migration to soil vapor, groundwater samples will be collected from the top of the water table. The purge water will be monitored for turbidity and water quality indicators (i.e., pH, dissolved oxygen, oxidation-reduction potential, temperature, and specific conductivity) with measurements collected approximately every five minutes. The criteria for stabilization will be three successive readings within ±10% for pH, temperature, and specific conductivity. Purge water needing to be managed on-site will be containerized in properly labeled, DOT-approved 55-gallon drums for off-site disposal at a permitted facility.

Groundwater samples slated for laboratory analysis will be placed in laboratory-supplied containers and shipped under COC in accordance with appropriate EPA protocols to a NYSDOH ELAP-certified laboratory. The samples will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, PCBs by EPA Method 8082, pesticides by EPA Method 8081, total and dissolved TAL metals by EPA Method 6000/7000 series, 1,4-Dx by EPA Method 8270 Selective Ion Monitoring (SIM), and PFAS by Modified EPA Method 537 using Category B deliverables. Filtering will occur in the field.

4.7 Soil Vapor Sampling

Six soil vapor samples (denoted as RI-SV-16 through RI-SV-20, and RI-SV-30) will be collected from six temporary vapor monitoring points at the approximate locations shown on Figure 8. Soil vapor point installation and sampling will be performed in accordance with the guidelines provided in the NYSDOH document entitled, “Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006.”

The temporary soil vapor points will be installed by advancing an expendable drive point using a Geoprobe™ direct-push drill rig to the target sampling depth. At each monitoring point, a six-inch stainless steel screen implant, connected to Teflon™ tubing, will be installed through the drilling rods and threaded into the drive point. The sampling tubing will extend from the end of the screen to above grade. The push probe rods will then be removed and the boring will be backfilled with clean silica sand to approximately three to six inches above the screen. Hydrated bentonite will be used to fill the remaining void around the sampling tubing to the ground surface.

Prior to sample collection, the sampling points will be purged of three sample volumes using a peristaltic pump or GilAir pump. During purging, a shroud will be placed over the sampling point and helium gas will be introduced through a small hole in the bucket to saturate the atmosphere around the sample port with helium gas. Purged vapors will be collected into a Tedlar™ bag and field-screened for organic vapors using a PID. The purged air will also be monitored using a portable helium detector to check for short-circuiting of ambient air into the vapor sampling point. If the purged soil vapor contains greater than 10% helium, additional bentonite will be used to enhance the surface seal, and the point will be retested.

Following purging, the soil vapor samples will be collected over a two-hour time period from each monitoring point using a 6-Liter, batch-certified SUMMA® canister equipped with a vacuum gauge and flow regulator set at a maximum rate of 0.2 liter per minute. Immediately after opening the flow control valve, the initial SUMMA® canister vacuum (inches of mercury) will be noted.

After two hours, the flow controller valve will be closed, the final vacuum noted, and the canister placed in a shipping carton for delivery to the laboratory.

The soil vapor samples will be analyzed for VOCs by EPA Method TO-15/TO-15 SIM by a NYSDOH ELAP-certified laboratory with Category B deliverables. Samples will be shipped to the laboratory with a COC.

The rationale for the proposed soil vapor sample locations is summarized in In-Text Table 4.

In-Text Table 4
Proposed Soil Vapor Sample Rationale

Vapor Point ID	On-Site Location	Analytical Parameter	Rationale
RI-SV-16	Southwestern	VOCs	To evaluate the potential for off-site exposures to the south and to complete the significant threat determination
RI-SV-17	Western	VOCs	To evaluate the nature and extent of chlorinated solvent-related VOCs detected in soil vapor during the Phase II and to complete the significant threat determination
RI-SV-18	Western	VOCs	To evaluate the potential for off-site exposures to the west and to complete the significant threat determination
RI-SV-19	Northwestern	VOCs	To evaluate the potential for off-site exposures to the north and to complete the significant threat determination
RI-SV-20	Northern	VOCs	To evaluate the potential for off-site exposures to the north and to complete the significant threat determination
RI-SV-30	Southwestern	VOCs	To evaluate the potential for off-site exposures to the southwest and to complete the significant threat determination

4.8 Quality Assurance/Quality Control (QA/QC)

Additional analysis will be included for quality control measures, as required by the Category B sampling techniques. The QA/QC samples for soil and groundwater will include at least one field blank, one trip blank, one matrix spike/matrix spike duplicate (MS/MSD), and one blind duplicate sample at a frequency of at least 1 sample per 20 field samples per media. The field blank, blind duplicate, and MS/MSD samples will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, pesticides by EPA Method 8081, PCBs by EPA Method 8082, TAL metals by EPA Method 6000/7000s series (plus hexavalent chromium by EPA Method 7196 for soil, and total and dissolved metals for groundwater), PFAS by Modified EPA Method 537.1, and 1,4-Dx by EPA Method 8270 using Category B deliverables. The laboratory-prepared trip blanks will be submitted for analysis of VOCs only to determine the potential for cross-contamination. The QAPP describes the QA/QC protocols and procedures that will be followed during implementation of this RIWP. The QAPP is included as Appendix A.

4.9 Decontamination Procedures

All non-dedicated sampling equipment (e.g., submersible pumps and oil/water interface probe) will be decontaminated between sampling locations using the following procedure:

1. Scrub equipment with a bristle brush using a tap water/Alconox® solution.
2. Rinse with tap water.
3. Scrub again with a bristle brush using a tap water/Alconox® solution.

4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment.

4.10 Management of Investigation-Derived Waste (IDW)

All IDW will be used to backfill the corresponding borehole that generated it to within 24 inches of the surface, or will be disposed of or treated according to applicable local, state, and federal regulations. Soil and groundwater IDW exhibiting evidence of gross contamination will be containerized in DOT-approved 55-gallon drums. The drums will be sealed at the end of each workday and labeled with the date, the well or boring number(s), the type of waste (i.e., drill cuttings, decontamination fluids, development water, or purge water) and the name of an AKRF point-of-contact. All drums will be labeled "pending analysis" until laboratory data is available. All boreholes will be restored after backfilling. Handling of IDW and backfilling of boreholes will be conducted in accordance with Section 3.3(e) of DER-10.

5.0 REPORTING REQUIREMENTS

5.1 Remedial Investigation Report (RIR)

Upon completion of all field work and receipt of laboratory analytical results, an RIR will be prepared in compliance with Section 3.14 of DER-10. The RIR will: document field activities; present field and laboratory data; evaluate exposure pathways in an exposure assessment; identify and characterize the source(s) of contamination; provide a summary of the overall nature and extent of contamination using the applicable standards, criteria, and guidance; and discuss conclusions and recommendations drawn from the results of the RI.

5.1.1 Description of Field Activities

This section of the RIR will describe the field methods used to characterize the Site conditions, including: sampling techniques; field screening equipment; drilling and excavation equipment; monitoring well installation procedures; and management of IDW. This section will also include descriptions of hydrogeologic factors of the Site.

5.1.2 Soil Boring Assessment

The RIR will include a section that presents field and laboratory data for soil results. This section will include a description of soil characteristics and provide figures that illustrate soil boring locations. Field and laboratory analytical results will be presented in the body of the report and summarized in tables and figures, and the detected concentrations will be compared to regulatory standards and/or guidance values. Soil boring logs and laboratory analytical reports will be provided as attachments. Category B deliverables will be provided by the laboratory and a third-party Data Usability Summary Report (DUSR) will be prepared and discussed.

5.1.3 Groundwater Assessment

The RIR will include a section that presents field and laboratory data from the groundwater monitoring results. This section will include a description of groundwater characteristics and figures will be provided that illustrate monitoring well locations. Well survey data and water level measurements will be used to create a groundwater contour map and determine groundwater flow direction. Field and laboratory analytical results will be presented and compared with regulatory standards and/or guidance values. Well construction, well development, and low-flow groundwater sampling logs and laboratory analytical reports will be provided as attachments. Category B deliverables will be provided by the laboratory and a third-party DUSR will be prepared and discussed.

5.1.4 Soil Vapor Assessment

The RIR will include a section that presents field and laboratory data from the soil vapor results. This section will include a description of soil vapor characteristics and will discussion soil vapor sample analytical data. Figures will be provided that illustrate the soil vapor point locations. Field and laboratory analytical results will be presented and compared with regulatory standards and/or guidance values, as appropriate. Soil vapor logs and laboratory analytical reports will be provided as attachments. Category B deliverables will be provided by the laboratory and a third-party DUSR will be prepared and discussed.

5.1.5 Qualitative Human Health Exposure Assessment (QHHEA)

A QHHEA will be performed in accordance with DER-10 Section 3.3(c)4 and Appendix 3B. The assessment will be included in the RIR.

6.0 PROPOSED PROJECT SCHEDULE

In-Text Table 5
Proposed Project Schedule

Activity	Time To Complete
Submission of BCP Application, Draft RIWP, and IRM Work Plan	January 2022
Completeness Determination	February 2022
BCP Application, Draft RIWP, and IRM Work Plan Public Comment Period	March-April 2022
Draft RIWP and IRM Work Plan Comments Received	May 2022
Execute Brownfield Cleanup Agreement and Final Submittal/Approval of RIWP and IRM Work Plan	May-June 2022
Demolition of Convenience Store, Pump Islands, and Canopy	June 2022
Citizen Participation Plan (CPP) Submitted	May 2022
RI and IRM Initiated	July 2022
Draft RIR submitted to NYSDEC	August 2022
Draft Remedial Action Work Plan (RAWP) and Fact Sheet Submitted to NYSDEC	August 2022
45-day Public Comment Period for RAWP	September-October 2022
Final RAWP Submitted/Approved and Decision Document Issued	October-November 2022
Remedial/Construction Notice Fact Sheet Issued and Pre-Construction Meeting Conducted	November 2022
Begin Implementation of RAWP	November 2022
Execution of Environmental Easement	June 2023
Draft Site Management Plan (SMP) Submitted to NYSDEC	August 2023
Draft Final Engineering Report and Fact Sheet	October 2023
Certificate of Completion and Fact Sheet	December 2023
Completion of Building	June 2024

7.0 CERTIFICATION

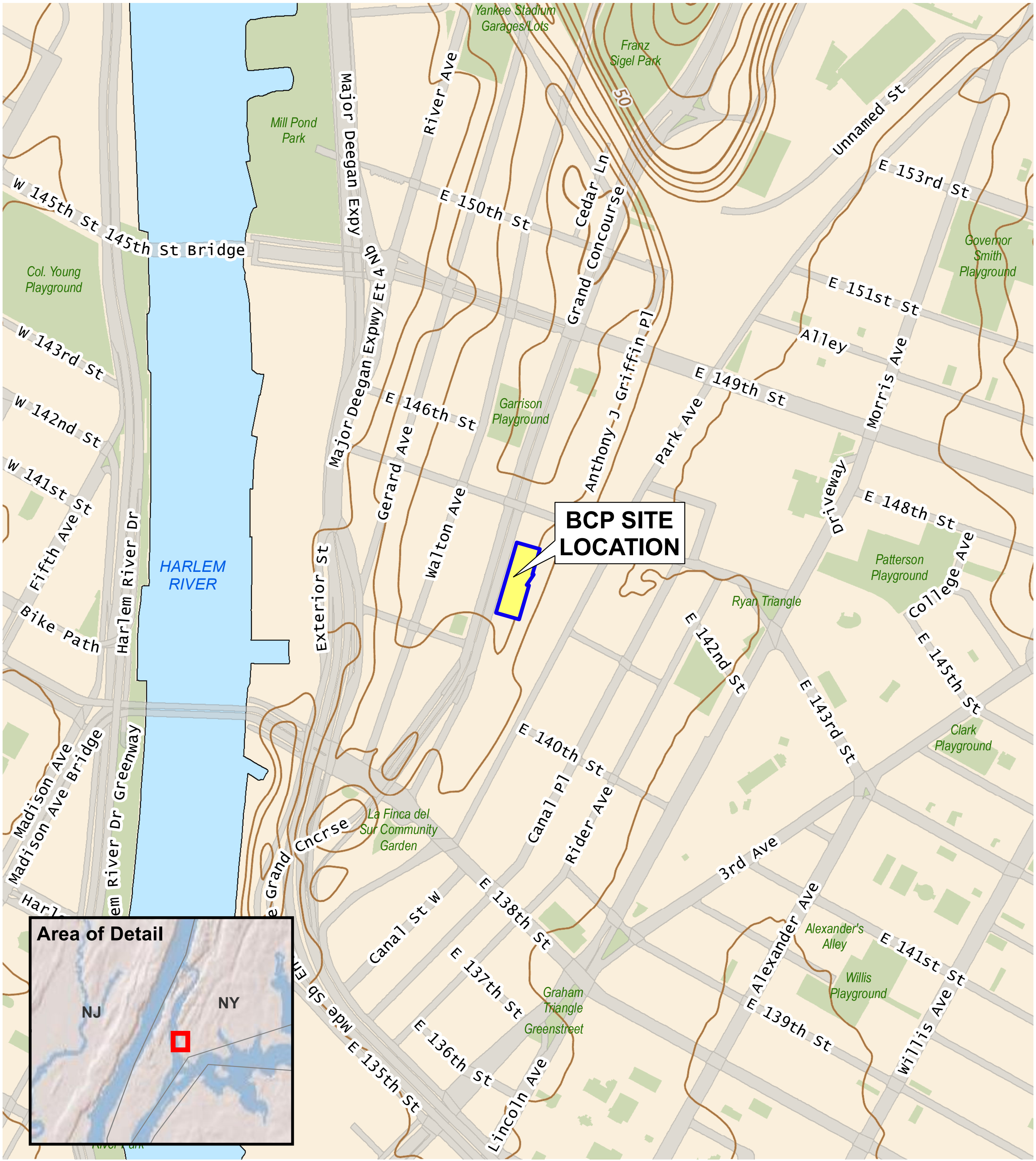
I, Deborah Shapiro, QEP, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance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

Deborah Shapiro, QEP	D. Shapiro	June 6, 2022
Name	***Signature***	***Date***

8.0 REFERENCES

1. Phase I Environmental Site Assessment, 350 and 370 Grand Concourse, Bronx, New York, AKRF, October 2021.
2. Subsurface (Phase II) Investigation Report, 350 and 370 Grand Concourse, Bronx, New York, AKRF, October 2021.
3. U.S. Geological Survey; Central Park NY-NJ Quadrangle (2013); 7.5-minute Series (Topographic), Scale 1:24,000, 1966, Photo revised 1979.
4. 6 NYCRR Section 375-6: Remedial Program Soil Cleanup Objectives (SCOs), December 14, 2006.
5. NYSDEC Division of Water Technical and Operational Guidance Series 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, March 1998.
6. NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York Air Guideline Values (AGVs) and Table 3.3 Matrix 1 and 2 Chemicals, October 2006; revised in fact sheets released in September 2013 for tetrachloroethene (PCE) and August 2015 for trichloroethene (TCE), and in the May 2017 Matrix Values updates.

FIGURES



Service Layer Credits: USGS The National Map: 3d Elevation Program, Data Refreshed July, 2021

AKRF
440 Park Avenue South, New York, NY 10016

350 Grand Concourse
Bronx, New York

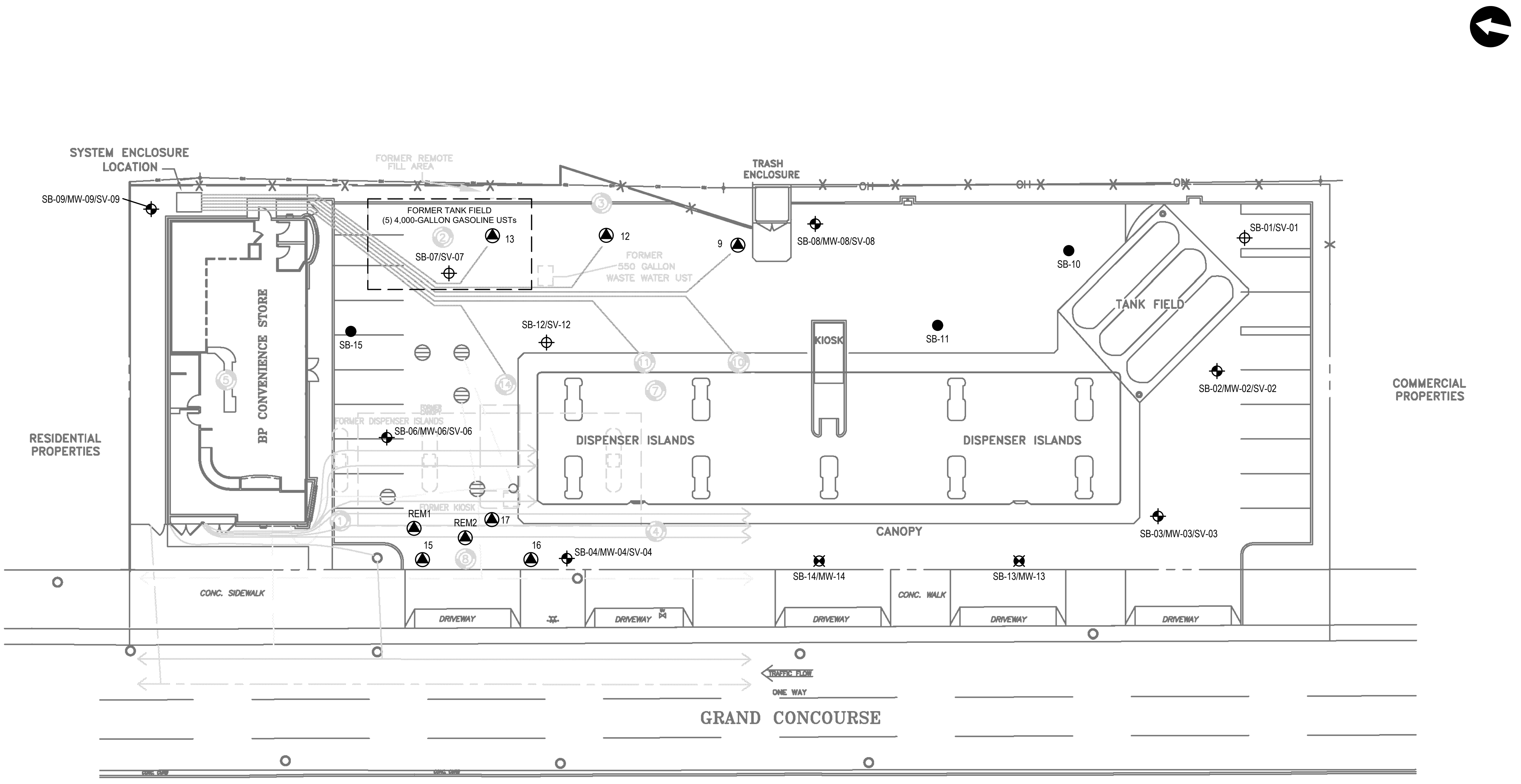
BCP SITE LOCATION

DATE
11/19/2021

PROJECT NO.
210258

FIGURE
1

©2021 AKRF W:\Projects\210258 - 350 GRAND CONCOURSE\Technical\GIS and Graphics\SAR\210258 Fig 1 Site Location map.mxd11/19/2021 1:02:02 PM mveilleux



LEGEND

▭ BCP SITE BOUNDARY

● SOIL BORING LOCATION

▲ EXISTING MONITORING WELL LOCATION FROM PREVIOUS ASSESSMENT/REMEDIAL ACTIVITIES (INSTALLED BY OTHERS)

⊕ SOIL BORING/SOIL VAPOR POINT LOCATION

☒ SOIL BORING/MONITORING WELL LOCATION

◆ SOIL BORING/MONITORING WELL/SOIL VAPOR POINT LOCATION

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SCALE IN FEET

Map Source:
EnviroTrac "370 Grand Concourse Bronx, New York - Site Plan", Figure 2, Dated April 16, 2019.

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350 Grand Concourse
Bronx, New York

SITE PLAN AND SAMPLE LOCATIONS

DATE
11/19/2021

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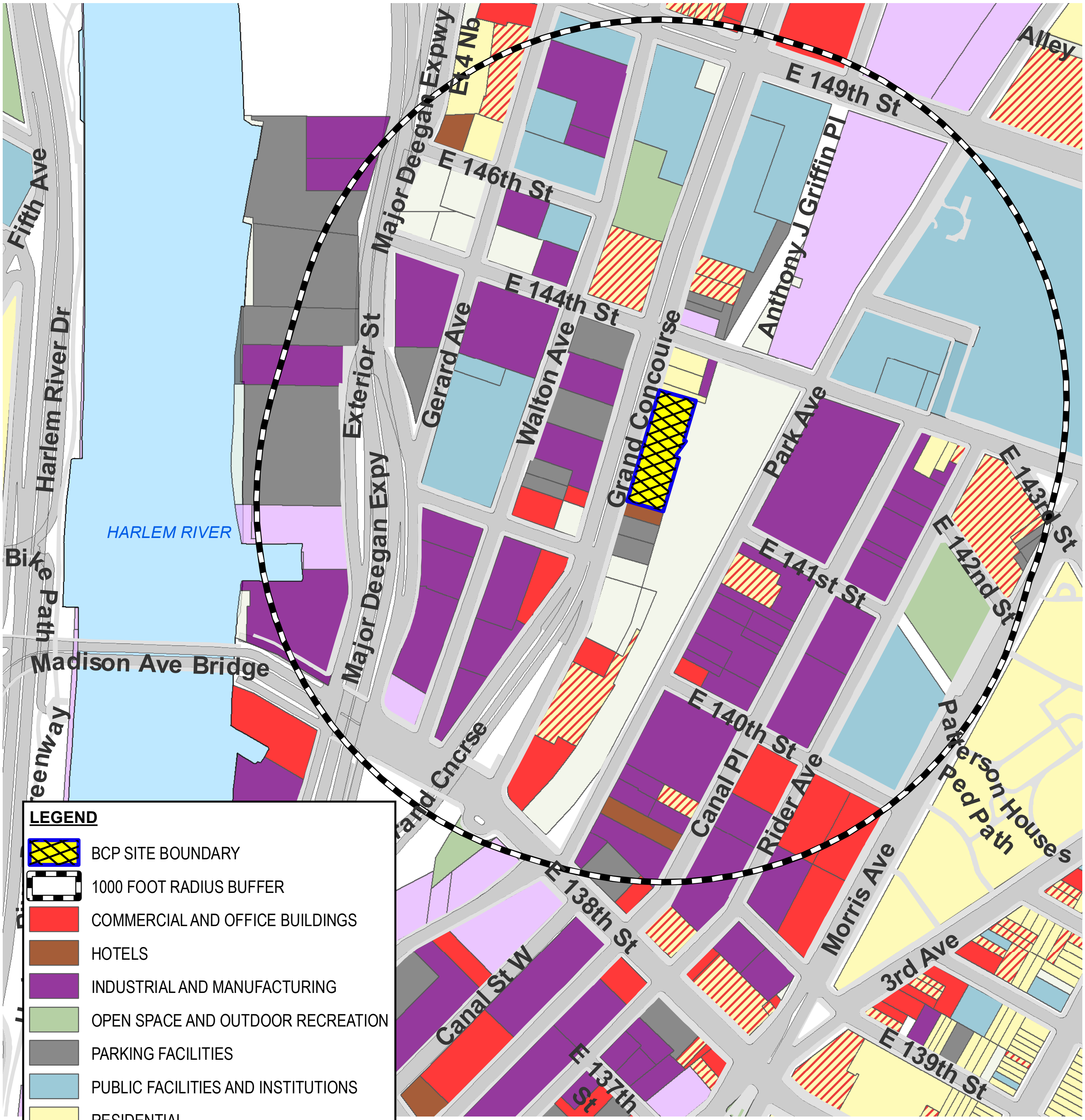
FIGURE
2

©2021 AKRF, Inc W:\Projects\210258 - 350 GRAND CONCOURSE\Technical\Hazmat\CAD\210258 Fig 2 Site Plan and Sample Locations.dwg last save: mveilleux 11/19/2021 12:58 PM



LEGEND

- ▩ BCP SITE BOUNDARY
- ◌ 1000 FOOT RADIUS BUFFER
- 🟥 COMMERCIAL AND OFFICE BUILDINGS
- 🟫 HOTELS
- 🟪 INDUSTRIAL AND MANUFACTURING
- 🟩 OPEN SPACE AND OUTDOOR RECREATION
- ⬛ PARKING FACILITIES
- 🟦 PUBLIC FACILITIES AND INSTITUTIONS
- 🟨 RESIDENTIAL
- ▨ RESIDENTIAL WITH COMMERCIAL BELOW
- 🟪 TRANSPORTATION AND UTILITY
- ⬜ VACANT LAND
- ▨ VACANT BUILDING
- ▨ UNDER CONSTRUCTION
- 🟦 HYDROGRAPHY - WATER

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database

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©2021 AKRF W:\Projects\210258 - 350 GRAND CONCOURSE\Technical\GIS and Graphics\SAR\BCP App\210258 Fig 5 Land Use map with Site Boundary.mxd11/19/2021 12:50:13 PM mveilleux

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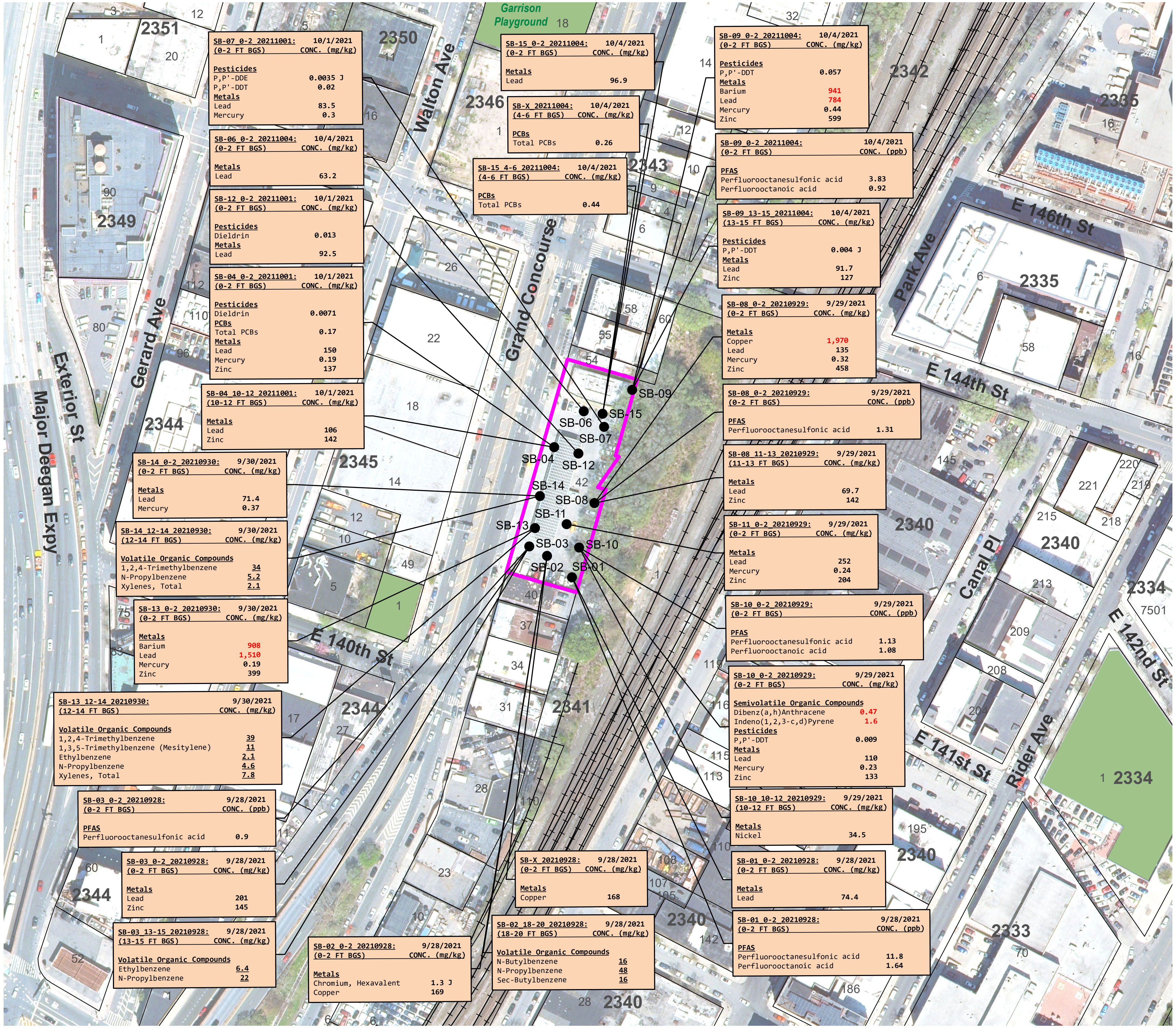
350 Grand Concourse
Bronx, New York

LAND USE MAP WITH SITE BOUNDARY

DATE
11/19/2021

PROJECT NO.
210258

FIGURE
3



SB-07_0-2_20211001: (0-2 FT BGS)	10/1/2021 CONC. (mg/kg)
Pesticides	
P,P'-DDE	0.0035 J
P,P'-DDT	0.02
Metals	
Lead	83.5
Mercury	0.3

SB-06_0-2_20211004: (0-2 FT BGS)	10/4/2021 CONC. (mg/kg)
Metals	
Lead	63.2

SB-12_0-2_20211001: (0-2 FT BGS)	10/1/2021 CONC. (mg/kg)
Pesticides	
Dieldrin	0.013
Metals	
Lead	92.5

SB-04_0-2_20211001: (0-2 FT BGS)	10/1/2021 CONC. (mg/kg)
Pesticides	
Dieldrin	0.0071
PCBs	
Total PCBs	0.17
Metals	
Lead	150
Mercury	0.19
Zinc	137

SB-04_10-12_20211001: (10-12 FT BGS)	10/1/2021 CONC. (mg/kg)
Metals	
Lead	106
Zinc	142

SB-14_0-2_20210930: (0-2 FT BGS)	9/30/2021 CONC. (mg/kg)
Metals	
Lead	71.4
Mercury	0.37

SB-14_12-14_20210930: (12-14 FT BGS)	9/30/2021 CONC. (mg/kg)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	34
N-Propylbenzene	5.2
Xylenes, Total	2.1

SB-13_0-2_20210930: (0-2 FT BGS)	9/30/2021 CONC. (mg/kg)
Metals	
Barium	908
Lead	1,510
Mercury	0.19
Zinc	399

SB-13_12-14_20210930: (12-14 FT BGS)	9/30/2021 CONC. (mg/kg)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	39
1,3,5-Trimethylbenzene (Mesitylene)	11
Ethylbenzene	2.1
N-Propylbenzene	4.6
Xylenes, Total	7.8

SB-03_0-2_20210928: (0-2 FT BGS)	9/28/2021 CONC. (ppb)
PFAS	
Perfluorooctanesulfonic acid	0.9

SB-03_0-2_20210928: (0-2 FT BGS)	9/28/2021 CONC. (mg/kg)
Metals	
Lead	201
Zinc	145

SB-03_13-15_20210928: (13-15 FT BGS)	9/28/2021 CONC. (mg/kg)
Volatile Organic Compounds	
Ethylbenzene	6.4
N-Propylbenzene	22

SB-02_0-2_20210928: (0-2 FT BGS)	9/28/2021 CONC. (mg/kg)
Metals	
Chromium, Hexavalent	1.3 J
Copper	169

SB-15_0-2_20211004: (0-2 FT BGS)	10/4/2021 CONC. (mg/kg)
Metals	
Lead	96.9

SB-X_20211004: (4-6 FT BGS)	10/4/2021 CONC. (mg/kg)
PCBs	
Total PCBs	0.26

SB-15_4-6_20211004: (4-6 FT BGS)	10/4/2021 CONC. (mg/kg)
PCBs	
Total PCBs	0.44

SB-X_20210928: (0-2 FT BGS)	9/28/2021 CONC. (mg/kg)
Metals	
Copper	168

SB-02_18-20_20210928: (18-20 FT BGS)	9/28/2021 CONC. (mg/kg)
Volatile Organic Compounds	
N-Butylbenzene	16
N-Propylbenzene	48
Sec-Butylbenzene	16

SB-09_0-2_20211004: (0-2 FT BGS)	10/4/2021 CONC. (mg/kg)
Pesticides	
P,P'-DDT	0.057
Metals	
Barium	941
Lead	784
Mercury	0.44
Zinc	599

SB-09_0-2_20211004: (0-2 FT BGS)	10/4/2021 CONC. (ppb)
PFAS	
Perfluorooctanesulfonic acid	3.83
Perfluorooctanoic acid	0.92

SB-09_13-15_20211004: (13-15 FT BGS)	10/4/2021 CONC. (mg/kg)
Pesticides	
P,P'-DDT	0.004 J
Metals	
Lead	91.7
Zinc	127

SB-08_0-2_20210929: (0-2 FT BGS)	9/29/2021 CONC. (mg/kg)
Metals	
Copper	1,970
Lead	135
Mercury	0.32
Zinc	458

SB-08_0-2_20210929: (0-2 FT BGS)	9/29/2021 CONC. (ppb)
PFAS	
Perfluorooctanesulfonic acid	1.31

SB-08_11-13_20210929: (11-13 FT BGS)	9/29/2021 CONC. (mg/kg)
Metals	
Lead	69.7
Zinc	142

SB-11_0-2_20210929: (0-2 FT BGS)	9/29/2021 CONC. (mg/kg)
Metals	
Lead	252
Mercury	0.24
Zinc	204

SB-10_0-2_20210929: (0-2 FT BGS)	9/29/2021 CONC. (ppb)
PFAS	
Perfluorooctanesulfonic acid	1.13
Perfluorooctanoic acid	1.08

SB-10_0-2_20210929: (0-2 FT BGS)	9/29/2021 CONC. (mg/kg)
Semivolatile Organic Compounds	
Dibenz(a,h)Anthracene	0.47
Indeno(1,2,3-c,d)Pyrene	1.6
Pesticides	
P,P'-DDT	0.009
Metals	
Lead	110
Mercury	0.23
Zinc	133

SB-10_10-12_20210929: (10-12 FT BGS)	9/29/2021 CONC. (mg/kg)
Metals	
Nickel	34.5

SB-01_0-2_20210928: (0-2 FT BGS)	9/28/2021 CONC. (mg/kg)
Metals	
Lead	74.4

SB-01_0-2_20210928: (0-2 FT BGS)	9/28/2021 CONC. (ppb)
PFAS	
Perfluorooctanesulfonic acid	11.8
Perfluorooctanoic acid	1.64

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database

LEGEND

- ▭ BCP SITE BOUNDARY
- 42 LOT BOUNDARY AND TAX LOT NUMBER
- 2341 BLOCK NUMBER
- ┼─┼ RAILROAD
- ● SOIL BORING LOCATION

SOIL

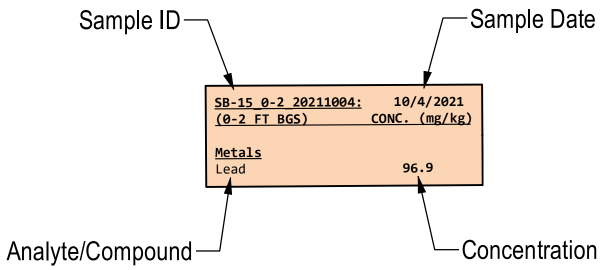
Part 375 Soil Cleanup Objectives (SCOs): SCOs listed in the New York State Department of Environmental Conservation (NYSDEC) "Part 375" Regulations (6 NYCRR Part 375).

Exceedances of NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) are presented in bold font.
Exceedances of NYSDEC Restricted Residential Soil Cleanup Objectives (RRSCOs) are presented in red.
Exceedances of NYSDEC Protected Groundwater Soil Cleanup Objectives (PGWSCOs) for VOCs are presented in underline.

mg/kg:milligrams per kilogram = parts per million (ppm)

J: The concentration given is an estimated value.

	PART 375 UNRESTRICTED mg/kg	PART 375 RESTRICTED RESIDENTIAL mg/kg	PART 375 PROTECTION OF GROUNDWATER mg/kg
Volatile Organic Compounds			
1,2,4-Trimethylbenzene	3.6	52	3.6
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	8.4
Ethylbenzene	1	41	1
N-Butylbenzene	12	100	12
N-Propylbenzene	3.9	100	3.9
Sec-Butylbenzene	11	100	11
Xylenes, Total	0.26	100	1.6
Semivolatile Organic Compounds			
Dibenz(a,h)Anthracene	0.33	0.33	1000
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	8.2
PCBs			
Total PCBs	0.1	1	3.2
Pesticides			
Dieldrin	0.005	0.2	0.1
P,P'-DDE	0.0033	8.9	17
P,P'-DDT	0.0033	7.9	136
Metals			
Barium	350	400	820
Chromium, Hexavalent	1	110	19
Copper	50	270	1720
Lead	63	400	450
Mercury	0.18	0.81	0.73
Nickel	30	310	130
Zinc	109	10000	2480



SB-15_0-2_20211004: (0-2 FT BGS)	10/4/2021 CONC. (mg/kg)
Metals	
Lead	96.9

0 150 300
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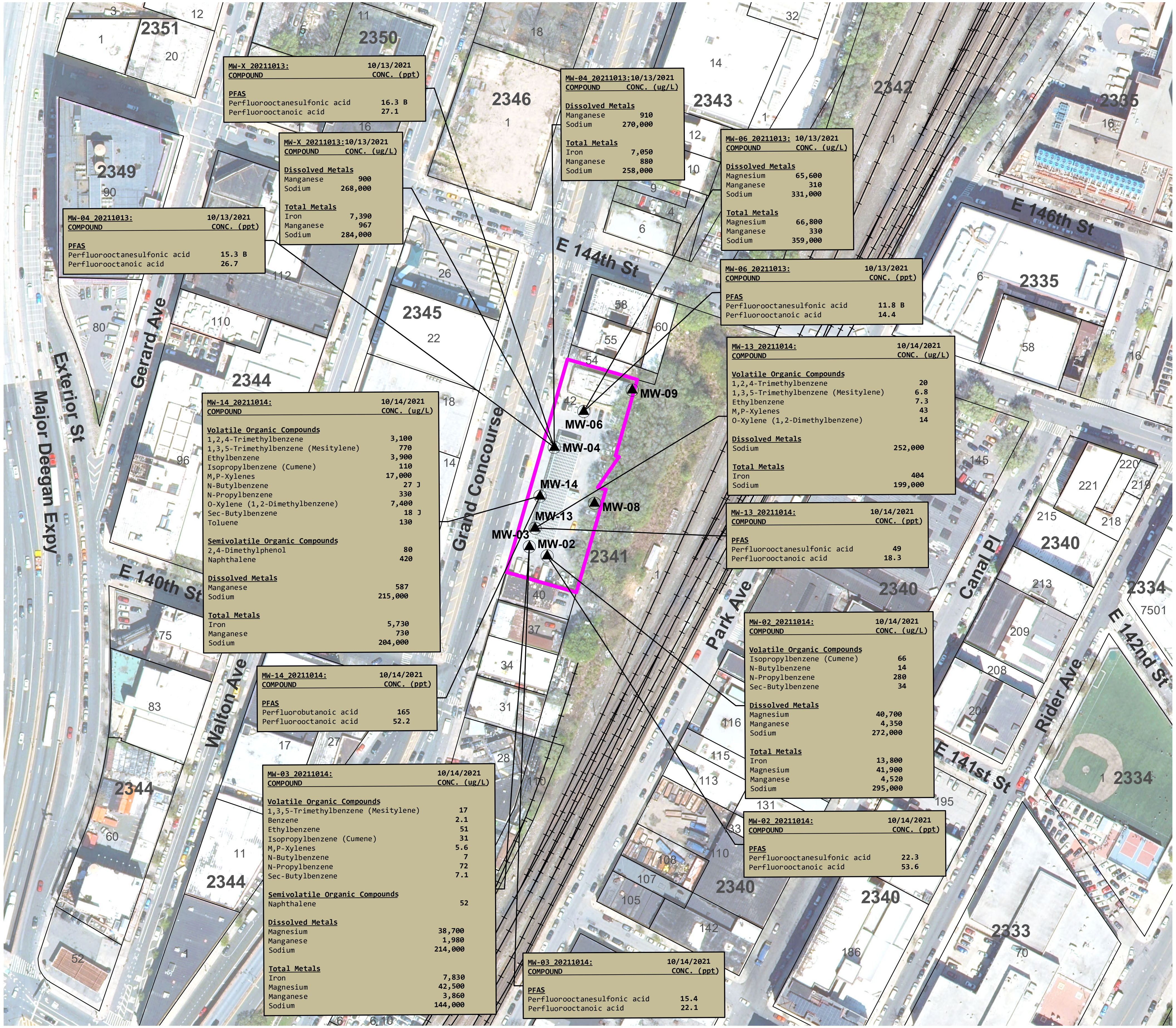
350 Grand Concourse
Bronx, New York

SOIL CONCENTRATIONS ABOVE NYSDEC UUSCOS,RRSCOS, AND/OR PGWSCOS

DATE
11/19/2021
PROJECT NO.
210258
FIGURE
4

W:\Projects\210258 - 350 GRAND CONCOURSE\Technical\GIS and Graphics\SAR\BCP App\210258 Fig 7 Soil Concentrations Above NYSDEC UUSCOs and RRSCOs.mxd11/19/2021 4:24:34 PM mvelleux



MW-X_20211013:	10/13/2021
COMPOUND	CONC. (ppt)
PFAS	
Perfluorooctanesulfonic acid	**16.3 B**
Perfluorooctanoic acid	**27.1**

MW-X_20211013:	10/13/2021
COMPOUND	CONC. (ug/L)
Dissolved Metals	
Manganese	**900**
Sodium	**268,000**
Total Metals	
Iron	**7,390**
Manganese	**967**
Sodium	**284,000**

MW-04_20211013:	10/13/2021
COMPOUND	CONC. (ppt)
PFAS	
Perfluorooctanesulfonic acid	**15.3 B**
Perfluorooctanoic acid	**26.7**

MW-04_20211013:	10/13/2021
COMPOUND	CONC. (ug/L)
Dissolved Metals	
Manganese	**910**
Sodium	**270,000**
Total Metals	
Iron	**7,050**
Manganese	**880**
Sodium	**258,000**

MW-06_20211013:	10/13/2021
COMPOUND	CONC. (ug/L)
Dissolved Metals	
Magnesium	**65,600**
Manganese	**310**
Sodium	**331,000**
Total Metals	
Magnesium	**66,800**
Manganese	**330**
Sodium	**359,000**

MW-06_20211013:	10/13/2021
COMPOUND	CONC. (ppt)
PFAS	
Perfluorooctanesulfonic acid	**11.8 B**
Perfluorooctanoic acid	**14.4**

MW-13_20211014:	10/14/2021
COMPOUND	CONC. (ug/L)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	**20**
1,3,5-Trimethylbenzene (Mesitylene)	**6.8**
Ethylbenzene	**7.3**
M,P-Xylenes	**43**
O-Xylene (1,2-Dimethylbenzene)	**14**
Dissolved Metals	
Sodium	**252,000**
Total Metals	
Iron	**404**
Sodium	**199,000**

MW-13_20211014:	10/14/2021
COMPOUND	CONC. (ppt)
PFAS	
Perfluorooctanesulfonic acid	**49**
Perfluorooctanoic acid	**18.3**

MW-14_20211014:	10/14/2021
COMPOUND	CONC. (ug/L)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	**3,100**
1,3,5-Trimethylbenzene (Mesitylene)	**770**
Ethylbenzene	**3,900**
Isopropylbenzene (Cumene)	**110**
M,P-Xylenes	**17,000**
N-Butylbenzene	**27 J**
N-Propylbenzene	**330**
O-Xylene (1,2-Dimethylbenzene)	**7,400**
Sec-Butylbenzene	**18 J**
Toluene	**130**
Semivolatile Organic Compounds	
2,4-Dimethylphenol	**80**
Naphthalene	**420**
Dissolved Metals	
Manganese	**587**
Sodium	**215,000**
Total Metals	
Iron	**5,730**
Manganese	**730**
Sodium	**204,000**

MW-14_20211014:	10/14/2021
COMPOUND	CONC. (ppt)
PFAS	
Perfluorobutanoic acid	**165**
Perfluorooctanoic acid	**52.2**

MW-02_20211014:	10/14/2021
COMPOUND	CONC. (ug/L)
Volatile Organic Compounds	
Isopropylbenzene (Cumene)	**66**
N-Butylbenzene	**14**
N-Propylbenzene	**280**
Sec-Butylbenzene	**34**
Dissolved Metals	
Magnesium	**40,700**
Manganese	**4,350**
Sodium	**272,000**
Total Metals	
Iron	**13,800**
Magnesium	**41,900**
Manganese	**4,520**
Sodium	**295,000**

MW-02_20211014:	10/14/2021
COMPOUND	CONC. (ppt)
PFAS	
Perfluorooctanesulfonic acid	**22.3**
Perfluorooctanoic acid	**53.6**

MW-03_20211014:	10/14/2021
COMPOUND	CONC. (ug/L)
Volatile Organic Compounds	
1,3,5-Trimethylbenzene (Mesitylene)	**17**
Benzene	**2.1**
Ethylbenzene	**51**
Isopropylbenzene (Cumene)	**31**
M,P-Xylenes	**5.6**
N-Butylbenzene	**7**
N-Propylbenzene	**72**
Sec-Butylbenzene	**7.1**
Semivolatile Organic Compounds	
Naphthalene	**52**
Dissolved Metals	
Magnesium	**38,700**
Manganese	**1,980**
Sodium	**214,000**
Total Metals	
Iron	**7,830**
Magnesium	**42,500**
Manganese	**3,860**
Sodium	**144,000**

MW-03_20211014:	10/14/2021
COMPOUND	CONC. (ppt)
PFAS	
Perfluorooctanesulfonic acid	**15.4**
Perfluorooctanoic acid	**22.1**

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database

LEGEND

▭	BCP SITE BOUNDARY
42	LOT BOUNDARY AND TAX LOT NUMBER
2341	BLOCK NUMBER
┼─┼	RAILROAD
▲	MONITORING WELL LOCATION

GROUNDWATER

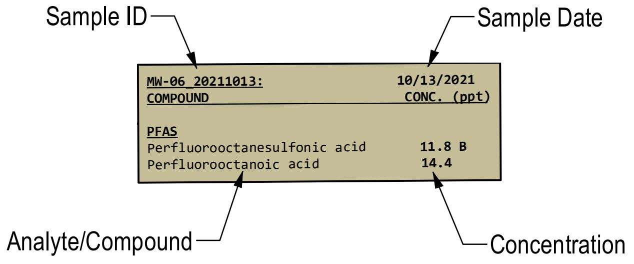
NYSDEC TOGS Class GA Ambient Water Quality Standard and Guidance Values (AWQSGVs): New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance Series (TOGS) (1.1.1):

PFAS: Per- and polyfluoroalkyl substances

µg/L: micrograms per Liter = parts per billion (ppb)

Only Exceedances of NYSDEC AWQSGVs are shown in bold font.

	NYSDEC AWQSGVs ug/l	NYSDEC PFAS Screening Levels ppt
Volatile Organic Compounds		
1,2,4-Trimethylbenzene	5	
1,3,5-Trimethylbenzene (Mesitylene)	5	
Benzene	1	
Ethylbenzene	5	
Isopropylbenzene (Cumene)	5	
Naphthalene	10	
N-Butylbenzene	5	
N-Propylbenzene	5	
O-Xylene (1,2-Dimethylbenzene)	5	
Sec-Butylbenzene	5	
Toluene	5	
Xylenes, M,P	5	
Semivolatile Organic Compounds		
2,4-Dimethylphenol	50	
Metals		
Iron	300	
Magnesium	35000	
Manganese	300	
Sodium	20000	
PFAS		
Perfluorooctanesulfonic acid (PFOS)		10
Perfluorooctanoic acid (PFOA)		10



MW-06_20211013:	10/13/2021
COMPOUND	CONC. (ppt)
PFAS	
Perfluorooctanesulfonic acid	11.8 B
Perfluorooctanoic acid	14.4

0 150 300
SCALE IN FEET

440 Park Avenue South, New York, NY 10016

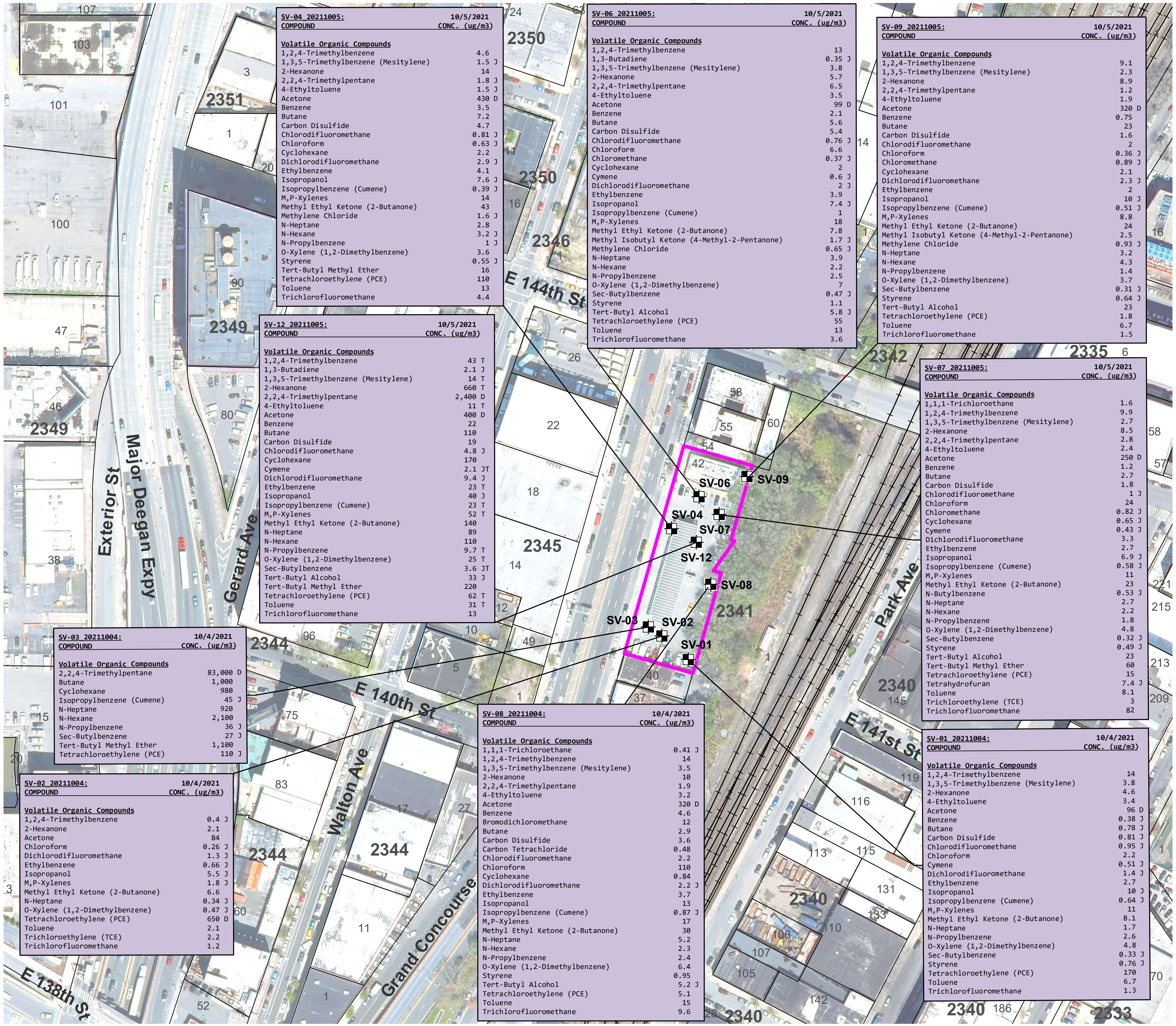
350 Grand Concourse
Bronx, New York

GROUNDWATER CONCENTRATIONS ABOVE NYSDEC AWQSGVS AND PFAS SCREENING LEVELS

DATE
11/23/2021

PROJECT NO.
210258

FIGURE
5



SV-04_20211005: 10/5/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	4.6
1,3,5-Trimethylbenzene (Mesitylene)	1.5 J
2-Hexanone	14
2,2,4-Trimethylpentane	1.8 J
4-Ethyltoluene	1.5 J
Acetone	430 D
Benzene	3.5
Butane	7.2
Carbon Disulfide	4.7
Chlorodifluoromethane	0.81 J
Chloroform	0.63 J
Cyclohexane	2.2
Dichlorodifluoromethane	2.9 J
Ethylbenzene	4.1
Isopropanol	7.6 J
Isopropylbenzene (Cumene)	0.39 J
M,P-Xylenes	14
Methyl Ethyl Ketone (2-Butanone)	43
Methylene Chloride	1.6 J
N-Heptane	2.8
N-Hexane	3.2 J
N-Propylbenzene	1 J
O-Xylene (1,2-Dimethylbenzene)	3.6
Styrene	0.55 J
Tert-Butyl Methyl Ether	16
Tetrachloroethylene (PCE)	110
Toluene	13
Trichlorofluoromethane	4.4

SV-06_20211005: 10/5/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	13
1,3-Butadiene	0.35 J
1,3,5-Trimethylbenzene (Mesitylene)	3.8
2-Hexanone	5.7
2,2,4-Trimethylpentane	6.5
4-Ethyltoluene	3.5
Acetone	99 D
Benzene	2.1
Butane	5.6
Carbon Disulfide	5.4
Chlorodifluoromethane	0.76 J
Chloroform	6.6
Chloromethane	0.37 J
Cyclohexane	2
Cymene	0.6 J
Dichlorodifluoromethane	2 J
Ethylbenzene	3.9
Isopropanol	7.4 J
Isopropylbenzene (Cumene)	1
M,P-Xylenes	18
Methyl Ethyl Ketone (2-Butanone)	7.8
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	1.7 J
Methylene Chloride	0.65 J
N-Heptane	3.9
N-Hexane	2.2
N-Propylbenzene	2.5
O-Xylene (1,2-Dimethylbenzene)	7
Sec-Butylbenzene	0.47 J
Styrene	1.1
Tert-Butyl Alcohol	5.8 J
Tetrachloroethylene (PCE)	55
Toluene	13
Trichlorofluoromethane	3.6

SV-09_20211005: 10/5/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	9.1
1,3,5-Trimethylbenzene (Mesitylene)	2.3
2-Hexanone	8.9
2,2,4-Trimethylpentane	1.2
4-Ethyltoluene	1.9
Acetone	320 D
Benzene	0.75
Butane	23
Carbon Disulfide	1.6
Chlorodifluoromethane	2
Chloroform	0.36 J
Chloromethane	0.89 J
Cyclohexane	2.1
Dichlorodifluoromethane	2.3 J
Ethylbenzene	2
Isopropanol	10 J
Isopropylbenzene (Cumene)	0.51 J
M,P-Xylenes	8.8
Methyl Ethyl Ketone (2-Butanone)	24
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	2.5
Methylene Chloride	0.93 J
N-Heptane	3.2
N-Hexane	4.3
N-Propylbenzene	1.4
O-Xylene (1,2-Dimethylbenzene)	3.7
Sec-Butylbenzene	0.31 J
Styrene	0.64 J
Tert-Butyl Alcohol	23
Tetrachloroethylene (PCE)	1.8
Toluene	6.7
Trichlorofluoromethane	1.5

SV-12_20211005: 10/5/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	43 T
1,3-Butadiene	2.1 J
1,3,5-Trimethylbenzene (Mesitylene)	14 T
2-Hexanone	660 T
2,2,4-Trimethylpentane	2,400 D
4-Ethyltoluene	11 T
Acetone	400 D
Benzene	22
Butane	110
Carbon Disulfide	19
Chlorodifluoromethane	4.8 J
Cyclohexane	170
Cymene	2.1 JT
Dichlorodifluoromethane	9.4 J
Ethylbenzene	23 T
Isopropanol	40 J
Isopropylbenzene (Cumene)	23 T
M,P-Xylenes	52 T
Methyl Ethyl Ketone (2-Butanone)	140
N-Heptane	89
N-Hexane	110
N-Propylbenzene	9.7 T
O-Xylene (1,2-Dimethylbenzene)	25 T
Sec-Butylbenzene	3.6 JT
Tert-Butyl Alcohol	33 J
Tert-Butyl Methyl Ether	220
Tetrachloroethylene (PCE)	62 T
Toluene	31 T
Trichlorofluoromethane	13

SV-07_20211005: 10/5/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	1.6
1,2,4-Trimethylbenzene	9.9
1,3,5-Trimethylbenzene (Mesitylene)	2.7
2-Hexanone	8.5
2,2,4-Trimethylpentane	2.8
4-Ethyltoluene	2.4
Acetone	250 D
Benzene	1.2
Butane	2.7
Carbon Disulfide	1.8
Chlorodifluoromethane	1 J
Chloroform	24
Chloromethane	0.82 J
Cyclohexane	0.65 J
Cymene	0.43 J
Dichlorodifluoromethane	3.3
Ethylbenzene	2.7
Isopropanol	6.9 J
Isopropylbenzene (Cumene)	0.58 J
M,P-Xylenes	11
Methyl Ethyl Ketone (2-Butanone)	23
N-Butylbenzene	0.53 J
N-Heptane	2.7
N-Hexane	2.2
N-Propylbenzene	1.8
O-Xylene (1,2-Dimethylbenzene)	4.8
Sec-Butylbenzene	0.32 J
Styrene	0.49 J
Tert-Butyl Alcohol	23
Tert-Butyl Methyl Ether	60
Tetrachloroethylene (PCE)	15
Tetrahydrofuran	7.4 J
Toluene	8.1
Trichloroethylene (TCE)	3
Trichlorofluoromethane	82

SV-03_20211004: 10/4/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
2,2,4-Trimethylpentane	83,000 D
Butane	1,000
Cyclohexane	980
Isopropylbenzene (Cumene)	45 J
N-Heptane	920
N-Hexane	2,100
N-Propylbenzene	36 J
Sec-Butylbenzene	27 J
Tert-Butyl Methyl Ether	1,100
Tetrachloroethylene (PCE)	110 J

SV-02_20211004: 10/4/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	0.4 J
2-Hexanone	2.1
Acetone	84
Chloroform	0.26 J
Dichlorodifluoromethane	1.3 J
Ethylbenzene	0.66 J
Isopropanol	5.5 J
M,P-Xylenes	1.8 J
Methyl Ethyl Ketone (2-Butanone)	6.6
N-Heptane	0.34 J
O-Xylene (1,2-Dimethylbenzene)	0.47 J
Tetrachloroethylene (PCE)	650 D
Toluene	2.1
Trichloroethylene (TCE)	2.2
Trichlorofluoromethane	1.2

SV-08_20211004: 10/4/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	0.41 J
1,2,4-Trimethylbenzene	14
1,3,5-Trimethylbenzene (Mesitylene)	3.5
2-Hexanone	10
2,2,4-Trimethylpentane	1.9
4-Ethyltoluene	3.2
Acetone	320 D
Benzene	4.6
Bromodichloromethane	12
Butane	2.9
Carbon Disulfide	3.6
Carbon Tetrachloride	0.48
Chlorodifluoromethane	2.2
Chloroform	110
Cyclohexane	0.84
Dichlorodifluoromethane	2.2 J
Ethylbenzene	3.7
Isopropanol	13
Isopropylbenzene (Cumene)	0.87 J
M,P-Xylenes	17
Methyl Ethyl Ketone (2-Butanone)	30
N-Heptane	5.2
N-Hexane	2.3
N-Propylbenzene	2.4
O-Xylene (1,2-Dimethylbenzene)	6.4
Styrene	0.95
Tert-Butyl Alcohol	5.2 J
Tetrachloroethylene (PCE)	5.1
Toluene	15
Trichlorofluoromethane	9.6

SV-01_20211004: 10/4/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	14
1,3,5-Trimethylbenzene (Mesitylene)	3.8
2-Hexanone	4.6
4-Ethyltoluene	3.4
Acetone	96 D
Benzene	0.38 J
Butane	0.78 J
Carbon Disulfide	0.81 J
Chlorodifluoromethane	0.95 J
Chloroform	2.2
Cymene	0.51 J
Dichlorodifluoromethane	1.4 J
Ethylbenzene	2.7
Isopropanol	10 J
Isopropylbenzene (Cumene)	0.64 J
M,P-Xylenes	11
Methyl Ethyl Ketone (2-Butanone)	8.1
N-Heptane	1.7
N-Propylbenzene	2.6
O-Xylene (1,2-Dimethylbenzene)	4.8
Sec-Butylbenzene	0.33 J
Styrene	0.76 J
Tetrachloroethylene (PCE)	170
Toluene	6.7
Trichlorofluoromethane	1.3

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database

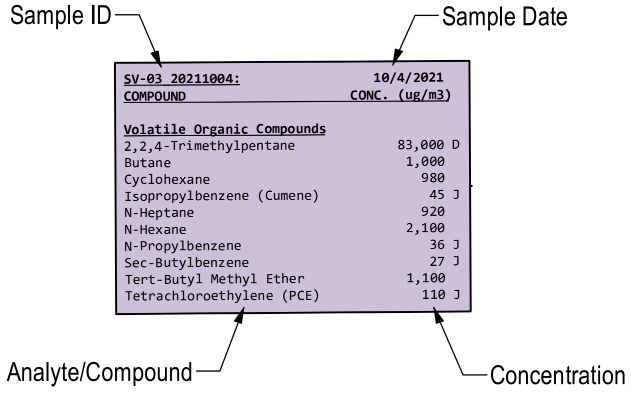
LEGEND

🟪	BCP SITE BOUNDARY
42	LOT BOUNDARY AND TAX LOT NUMBER
2341	BLOCK NUMBER
┼─┼─┼	RAILROAD
▚	SOL VAPOR POINT LOCATION

SOIL VAPOR

µg/m³- micrograms per cubic meter

D: Analyte concentration obtained from dilution.
J: The concentration given is an estimated value.
T: Indicates that a quality control parameter has exceeded laboratory limits



SV-03_20211004: 10/4/2021

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
2,2,4-Trimethylpentane	83,000 D
Butane	1,000
Cyclohexane	980
Isopropylbenzene (Cumene)	45 J
N-Heptane	920
N-Hexane	2,100
N-Propylbenzene	36 J
Sec-Butylbenzene	27 J
Tert-Butyl Methyl Ether	1,100
Tetrachloroethylene (PCE)	110 J

0 150 300
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

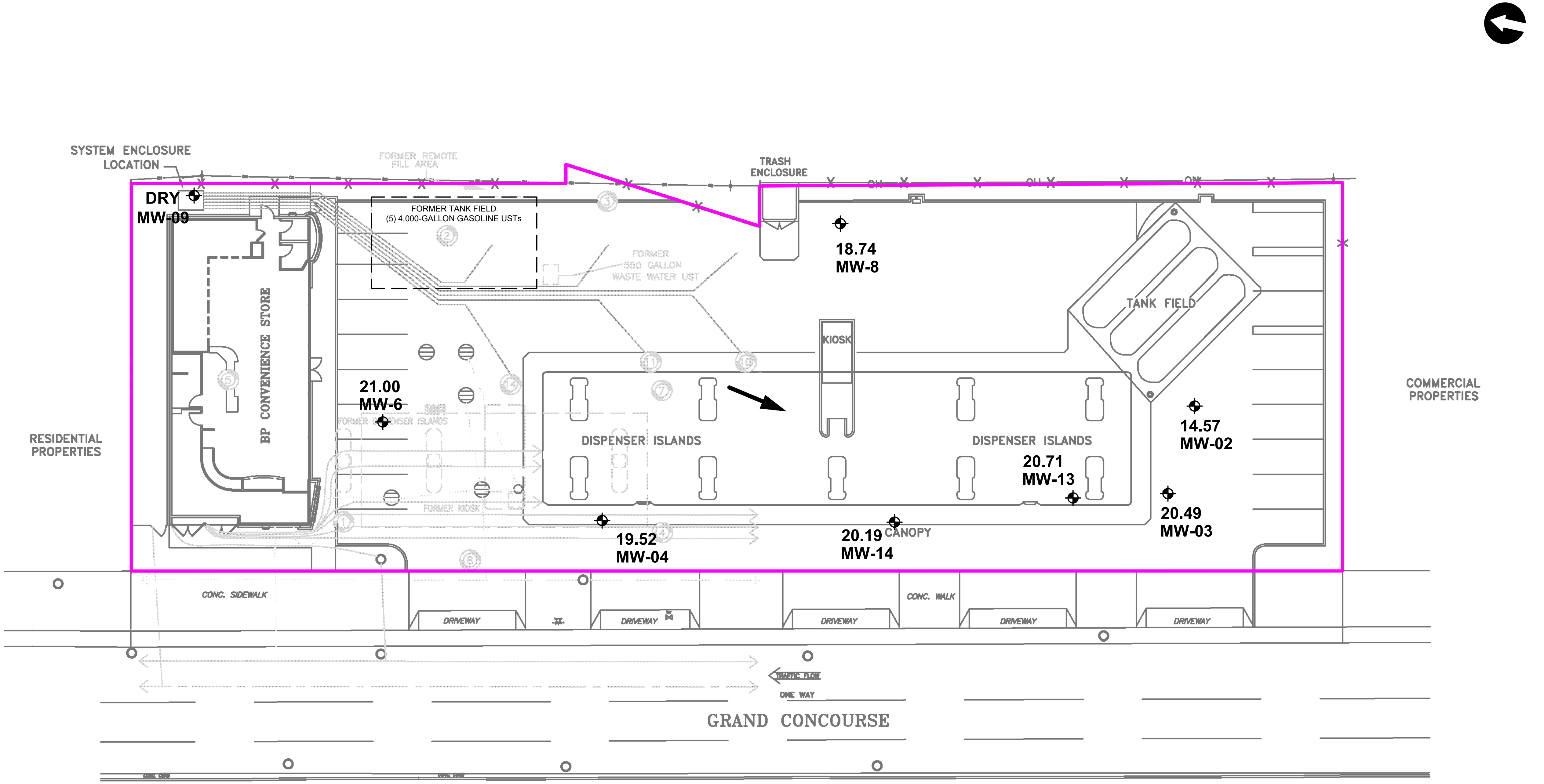
350 Grand Concourse
Bronx, New York

SOIL VAPOR SAMPLE CONCENTRATIONS

DATE
11/19/2021

PROJECT NO.
210258

FIGURE
6



LEGEND

▭ BCP SITE BOUNDARY

⌖ MONITORING WELL LOCATION (OCTOBER 2021)

19.52 GROUNDWATER ELEVATION IN FEET MSL

→ GROUNDWATER FLOW DIRECTION

MSL = MEAN SEA LEVEL

Map Source:
EnviroTrac "370 Grand Concourse Bronx, New York - Site Plan", Figure 2, Dated April 16, 2019.
AKRF Monitoring Well Locations Surveyed by Fehringer Surveying, P.C. on October 14, 2021.

Note:
Groundwater Contours were not Included as Groundwater Appears to be Perched and Flows Along Bedrock Surface.

0 15 30 60
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

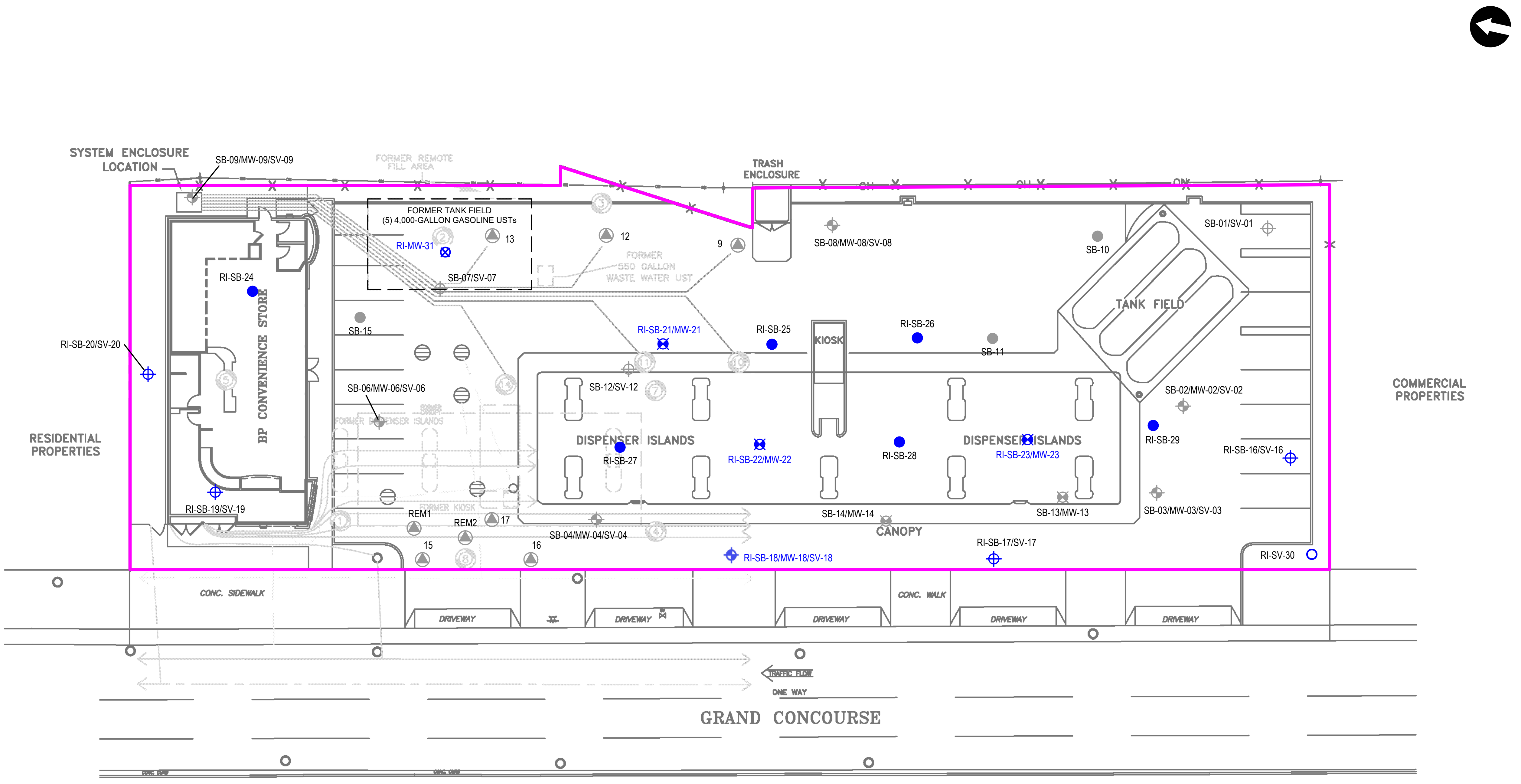
350 Grand Concourse
Bronx, New York

GROUNDWATER ELEVATION MAP - OCTOBER 2021

DATE
11/23/2021

PROJECT NO.
210258

FIGURE
7



LEGEND

▭ BCP SITE BOUNDARY

▲ EXISTING MONITORING WELL LOCATION FROM PREVIOUS ASSESSMENT/REMEDIAL ACTIVITIES (INSTALLED BY OTHERS)

● SOIL BORING LOCATION (OCTOBER 2021)

⊕ SOIL BORING/SOIL VAPOR POINT LOCATION (OCTOBER 2021)

⊠ SOIL BORING/MONITORING WELL LOCATION (OCTOBER 2021)

⊕ SOIL BORING/MONITORING WELL/SOIL VAPOR POINT LOCATION (OCTOBER 2021)

● PROPOSED SOIL BORING LOCATION

⊕ PROPOSED SOIL BORING/SOIL VAPOR POINT LOCATION

⊠ PROPOSED SOIL BORING/MONITORING WELL LOCATION

⊕ PROPOSED SOIL BORING/MONITORING WELL/SOIL VAPOR POINT LOCATION

○ PROPOSED SOIL VAPOR POINT LOCATION

⊗ PROPOSED MONITORING WELL LOCATION

0 15 30 60
SCALE IN FEET

Map Source:
EnviroTrac "370 Grand Concourse Bronx, New York - Site Plan", Figure 2, Dated April 16, 2019.
AKRF Monitoring Well Locations Surveyed by Fehringer Surveying, P.C. on October 14, 2021.

AKRF
440 Park Avenue South, New York, NY 10016

350 Grand Concourse
Bronx, New York

PROPOSED SAMPLE LOCATION PLAN

DATE
06/02/2022

PROJECT NO.
210258

FIGURE
8

©2021 AKRF, Inc W:\Projects\210258 - 350 GRAND CONCOURSE\Technical\Hazmat\CAD\210258 Fig 8 Proposed Sample Location Plan RIWP.dwg last save: mveilleux 11/23/2021 2:16 PM

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

350 GRAND RISING

350 GRAND CONCOURSE
BRONX, NEW YORK

Quality Assurance Project Plan

NYSDEC BCP Site #: C203153
AKRF Project Number: 210258

Prepared For:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau B
625 Broadway, 12th Floor
Albany, New York 12233

Prepared On Behalf Of:

350 Rising LLC
450 West 14th Street, 8th Floor
New York, New York 10014

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
212-696-0670

JUNE 2022

TABLE OF CONTENTS

TABLES

ATTACHMENTS

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of all environmental sampling, including under the Remedial Investigation Work Plan (RIWP) at 350 Grand Concourse in the Bronx, New York (the Site). The approximately 31,045-square-foot Site is identified on the New York City Tax Map as Bronx Borough Tax Block 2341, Lot 42. Historically, Lot 42 was divided into Lots 42 and 47; Lot 47 is associated with the historical address 370 Grand Concourse, Bronx, NY.

The objective of this QAPP is to provide Quality Assurance (QA) and maintain Quality Control (QC) of environmental investigative and sampling activities conducted under New York State Department of Environmental Conservation (NYSDEC) oversight in the Brownfield Cleanup Program (BCP) (BCP Site No. TBD). Adherence to this QAPP will ensure that defensible data will be obtained during all environmental work at the Site.

2.0 PROJECT TEAM

The project team will be drawn from AKRF professional and technical personnel, and AKRF's subcontractors. All field personnel and subcontractors will have completed a 40-hour training course and updated 8-hour refresher course that meet the Occupational Safety and Health Administration (OSHA) requirements of 29 CFR Part 1910. The following sections describe the key project personnel and their responsibilities.

2.1 Quality Assurance/Quality Control (QA/QC) Officer

Deborah Shapiro will serve as the QA/QC officer and will be responsible for adherence to the QAPP. The QA/QC officer will review the procedures with all personnel prior to commencing any fieldwork and will conduct periodic Site visits to assess implementation of the procedures. The QA/QC officer will also be responsible for reviewing the Data Usability Summary Reports (DUSRs) prepared by a third-party data validator for soil, groundwater, and soil vapor analytical results. Ms. Shapiro's resume is included in Attachment A.

2.2 Project Manager

The project manager will be responsible for directing and coordinating all elements of the RIWP. The project manager will prepare reports and participate in meetings with the Site owner/Volunteer, and/or NYSDEC. Scott Caporizzo will serve as the project manager for the RIWP. Mr. Caporizzo's resume is included in Attachment A.

2.3 Deputy Project Manager

The deputy project manager will be responsible for assisting the project manager. The deputy project manager will help prepare reports and will participate in meetings with the Site owner/Volunteer, and/or NYSDEC. Gregory Baird will serve as the deputy project manager for the RIWP. Mr. Baird's resume is included in Attachment A.

2.4 Field Team Leader, Field Technician, Site Safety Officer (SSO), and Alternates

The field team leader will be responsible for supervising the daily sampling and health and safety activities in the field and will ensure adherence to the RIWP and Health and Safety Plan (HASP), included as Appendix B of the RIWP. The field team leader will also act as the field technician and SSO, and will report to the project manager or deputy project manager on a regular basis regarding daily progress and any deviations from the work plan. The field team leader will be a qualified and responsible person able to act professionally and promptly during environmental work at the Site. Claire Bearden will be the field team leader. Ms. Bearden's resume is included in Attachment A.

2.5 Laboratory Quality Assurance/Quality Control (QA/QC) Officer

The laboratory QA/QC officer will be responsible for quality control procedures and checks in the laboratory and ensuring adherence to laboratory protocols. The QA/QC officer will track the movement of samples from the time they are checked in at the laboratory to the time that analytical results are issued, and will conduct a final check on the analytical calculations and sign off on the laboratory reports. The laboratory QA/QC officer will be Carl Ambruster of Eurofins TestAmerica Laboratories (Eurofins), the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory being employed for all environmental sampling at the Site.

2.6 Third-Party Data Validator

The third-party data validator will be responsible for reviewing the final data packages for soil, groundwater, and soil vapor and preparing a DUSR that will provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the laboratory analyses for the investigation. The third-party data validator will be Lori Beyer of L.A.B. Validation Corporation of East Northrop, New York.

3.0 STANDARD OPERATING PROCEDURES (SOPS)

The following sections describe the SOPs for the remedial activities included in the RIWP. During these activities, safety monitoring will be performed as described in the HASP, included as Appendix B of the RIWP.

3.1 Decontamination of Sampling Equipment

All sampling equipment (augers, drilling rods, split spoon samplers, probe rods, pumps, etc.) will be either dedicated or decontaminated between sampling locations. Decontamination will be conducted on plastic sheeting (or equivalent) that is bermed to prevent discharge to the ground. The decontamination procedure will be as follows:

1. Scrub using a tap water/Alconox® mixture and bristle brush.
2. Rinse with tap water.
3. Scrub again with a tap water/Alconox® mixture and bristle brush.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment, if possible.

3.2 Management of Investigation-Derived Waste (IDW)

IDW will be containerized in New York State Department of Transportation (NYSDOT)-approved 55-gallon drums. The drums will be sealed at the end of each workday and labeled with the date, the excavation grid(s), the type of waste (i.e., drill cuttings), and the name and phone number of an AKRF point-of-contact. All IDW exhibiting field evidence of contamination will be disposed of or treated according to applicable local, state, and federal regulations.

4.0 SAMPLING AND LABORATORY PROCEDURES

4.1 Soil Sampling

Soil sampling will be conducted according to the following procedures:

- Characterize the sample according to the modified Burmister soil classification system.
- Field screen the sample for evidence of contamination (e.g., odors, staining, etc.) using visual and olfactory methods and screen for volatile organic compounds (VOCs) using a photoionization detector (PID) equipped with an 11.7 electron Volt (eV) lamp.
- Collect an aliquot of soil from each proposed sample location, place in laboratory-supplied glassware, label the sample in accordance with Section 4.4.1, and place in an ice-filled cooler for shipment to the laboratory.
- Complete the proper chain of custody (COC) paperwork and seal the cooler.
- Record sample location, sample depth, and sample observations (evidence of contamination, PID readings, soil classification, etc.) in field log book and boring log data sheet, if applicable.
- Decontaminate any soil sampling equipment between sample locations as described in Section 3.1 of this QAPP.

4.2 Laboratory Methods

Table 1 summarizes the laboratory methods that will be used to analyze field samples and the sample container type, preservation, and applicable holding times. Eurofins, a NYSDOH ELAP-certified laboratory subcontracted to AKRF, will be used for all chemical analyses in accordance with the Division of Environmental Remediation (DER)-10 2.1(b) and 2.1(f) with Category B Deliverables.

Table 1
Laboratory Analytical Methods for Analysis Groups

Matrix	Analysis	EPA Method	Bottle Type	Preservative	Hold Time
Soil and Soil QA/QC	VOCs	8260C	EnCore® Samplers (3) and 2 oz. Plastic Jar	≤ 6 °C	48 hours to extract; 14 days to analyze
	Semivolatile Organic Compounds (SVOCs)	8270D	8 oz. Glass Jar	≤ 6 °C	14 days to extract; 40 days to analyze
	1,4-Dioxane	8270D; 0.1 mg/kg RL	4 oz. Glass Jar	≤ 6 °C	14 days to extract; 40 days to analyze
	Total Analyte List (TAL) Metals and Hexavalent Chromium	6000/7000 Series, 6010C, and 7196A	8 oz. Glass Jar	≤ 6 °C	6 months holding time; Mercury 28 days holding time; Hexavalent Chromium 30 days to extract, 7 days to analyze
	Pesticides	8081B	8 oz. Glass Jar	≤ 6 °C	14 days to extract; 40 days to analyze
	Polychlorinated Biphenyls (PCBs)	8082A	8 oz. Glass Jar	≤ 6 °C	14 days to extract; 40 days to analyze
	Per- and Polyfluoroalkyl Substances (PFAS)	Modified 537.1; 0.2 ng/L RL	4 oz. HDPE Plastic Container	≤ 6 °C	14 days to extract; 40 days to analyze
Groundwater and Groundwater QA/QC	VOCs	8260C	5 40 mL Glass Vials	HCl to pH < 2 and ≤ 6 °C	48 hours to extract; 14 days to analyze
	SVOCs	8270D	2,000 mL Amber Jar	≤ 6 °C	7 days to extract; 40 days to analyze
	1,4-Dioxane	8270D plus Selective Ion Monitoring (SIM); 0.35 µg/L RL	1 L Amber Jar	≤ 6 °C	7 days to extract; 40 days to analyze
	TAL Metals	6000/7000 Series	2,000 mL Amber Jar	HNO_3 to pH < 2	6 months for metals; 28 days for Mercury; 24 hours for Hexavalent Chromium
	Pesticides	8081B	2,000 mL Amber Jar	≤ 6 °C	7 days to extract; 40 days to analyze
	PCBs	8082A	2,000 mL Amber Jar	≤ 6 °C	7 days to extract; 40 days to analyze
	PFAS	Modified 537; 0.2 ng/L RL	3 x 250 mL Polypropylene Bottles	≤ 6 °C, Trizma	14 days to analyze
Soil Vapor	VOCs	TO-15/TO-15 SIM	6L SUMMA® Canister	None	14 days to analyze

Notes:
QA/QC samples will be analyzed for the same parameters as the parent sample, with the exception of the trip blank(s), which will be analyzed for VOCs by EPA Method 8260C only.
EPA – Environmental Protection Agency
mg/kg – milligrams per kilogram (parts per million)
µg/L – parts per billion
ng/L – parts per trillion

4.3 Quality Control (QC) Sampling

In addition to the laboratory analysis of the soil samples, additional analysis will be included for QC measures, as required by the Category B sampling techniques. These samples will include field blank, trip blank, matrix spike/matrix spike duplicate (MS/MSD), and blind duplicate samples at a frequency of 1 sample per 20 field samples collected or per sample digestion group (SDG). QC samples will be analyzed for the same parameters as the accompanying samples, with the exception of any trip blanks, which will be analyzed for the VOC list only.

4.4 Sample Handling

4.4.1 Sample Identification

All samples will be consistently identified in all field documentation, COC documents, and laboratory reports. Soil, groundwater, soil vapor, and ambient air samples collected during the RI will be identified with "RI-" and "SB-" for soil borings, "MW-" for groundwater monitoring wells, "SV-" for soil vapor points, and "AA-" for ambient air samples, followed by the soil boring, groundwater monitoring well, soil vapor point, or ambient air sample number. All samples will be amended with the collection date at the end of the sample same in a year, month, day (YYYYMMDD) format. Blind duplicate sample nomenclature will consist of the sample type, followed by an "X"; MS/MSD sample nomenclature will consist of the parent sample name only, but triplicate sample volume will be collected and the COC comment section will explain that the additional volume is for running the MS/MSD; and trip and field blanks will consist of "TB-" and "FB-", respectively, followed by "S" for soil and "GW" for groundwater, and a sequential number of the trip/field blanks collected within the SDG. Special characters, including primes/apostrophes ('), will not be used for sample nomenclature. Table 2 provides examples of the sampling identification scheme for samples collected during the RI.

Table 2
RI Sample Nomenclature

Sample Description	Sample Designation
Groundwater sample collected from groundwater monitoring well RI-MW-1 on March 1, 2021	RI-MW-01_20210301
Blind duplicate sample of groundwater sample collected from groundwater monitoring well RI-MW-1 on March 1, 2021	RI-MW-X_20210301
First trip blank collection during the RI on March 1, 2021	RI-TB-01_20210301
Second soil field blank collected during the RI on March 1, 2021	RI-FB-S-02_20210301
Soil sample collected from soil boring RI-SB-10 between 8 and 10 feet below grade on March 1, 2021	RI-SB-10(8-10)_20210301
Second blind duplicate soil sample of SDG collected from soil boring RI-SB-10 between 8 and 10 feet below grade on March 1, 2021	RI-SB-X02_20210301
Soil vapor sample collected from soil vapor point SV-17 on March 2, 2021	RI-SV-17_20210302

Sample Labeling and Shipping

All sample containers will be provided with labels containing the following information:

- Project identification, including Site name, BCP Site number, Site address
- Sample identification

- Date and time of collection
- Analysis(es) to be performed
- Sampler's initials

Once the samples are collected and labeled, they will be placed in chilled coolers and stored in a cool area away from direct sunlight to await shipment to the laboratory. All samples will be shipped to the laboratory at least twice per week. At the start and end of each workday, field personnel will add ice to the cooler(s) as needed.

The samples will be prepared for shipment by placing each sample in laboratory-supplied glassware, then wrapping each container in bubble wrap to prevent breakage and adding freezer packs and/or fresh ice in sealable plastic bags. The COC form will be properly completed by the sampler in ink, and all sample shipment transactions will be documented with signatures and the date and time of custody transfer. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with mailing tape and a COC seal to ensure that the samples remain under strict COC protocol.

Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; signatures of individuals involved in sample transfer; and the dates and times of transfers. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in.

4.5 Field Instrumentation

Field personnel will be trained in the proper operation of all field instruments at the start of the field program. Instruction manuals for the equipment will be on file at the Site for referencing proper operation, maintenance, and calibration procedures. The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager or QA/QC officer will be contacted immediately to obtain a replacement instrument. A calibration log will be maintained to record the date of each calibration, any failure to calibrate, and corrective actions taken. The PID will be equipped with an 11.7 eV lamp and will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas in accordance with the manufacturer's standards.

4.6 Quality Assurance (QA)

All soil, groundwater, and soil vapor laboratory analytical data will be reviewed by a third-party validator and a DUSR will be prepared to document the usability and validity of the data. The Remedial Investigation Report (RIR) will include a detailed description of endpoint sampling activities, data summary tables, a concentration map showing sample locations and concentrations, DUSRs, and laboratory reports.

ATTACHMENT A

RESUMES FOR QA/QC OFFICER, PROJECT MANAGER, DEPUTY PROJECT MANAGER, AND FIELD TEAM LEADER

DEBORAH SHAPIRO, QEP

SENIOR VICE PRESIDENT

Deborah Shapiro is a Senior Vice President in the Site Assessment and Remediation Department. Ms. Shapiro supervises project teams and manages all aspects of assessment and remediation projects across the New York Metropolitan Area. Ms. Shapiro works with developers, non-profit organizations, architects, local community groups, local businesses, and government agencies. Her projects fall under the regulatory oversight of NYSDEC, NYCDEP, and NYCOER including the New York State Brownfield Cleanup Program (BCP), New York City Voluntary Cleanup Program (VCP), NYSDEC petroleum spills program, RCRA/UIC closures, and NYCOER's E-designation program. Ms. Shapiro has also assisted commercial and industrial property owners with maintaining the integrity of their portfolios by providing compliance related cleanup and chemical storage management services. Ms. Shapiro has also been a moderator and panelist at numerous conferences.

Ms. Shapiro manages all aspects of redevelopment projects from the initial Phase I ESA, Phase II, and remediation through post-remedial site management. In addition, her experience includes groundwater investigations, monitoring, and sampling programs; Brownfield and hazardous waste site investigations; In-Situ Chemical Oxidation; underground storage tank studies, including soil contamination delineation, classification, removal and disposal; waste characterization sampling; exposure assessments; on-going remedial action (especially AS/SVE), and permitting.

BACKGROUND

Education

M.S., Environmental Science, American University, 2001
B.A., Environmental Studies, American University, 1998

Professional Licenses/Certifications

Qualified Environmental Professional
Health and Safety Operations at Hazardous Materials Sites 29 CFR 1910.120

OSHA 8 Hour HAZWOPER Supervisor

OSHA 10 Hour Occupational Construction Safety and Health

CPR

Professional Memberships

Past President, New York City Brownfield Partnership
Board Member, Residents for a More Beautiful Port Washington
Member, Institute of Professional Environmental Practitioners (IPEP)

Awards

Big Apple Brownfield Award recipient as part of the Elton Crossing redevelopment team 2017
Big Apple Brownfield Award recipient as part of the Courtlandt Crescent redevelopment team 2013
Big Apple Brownfield Award recipient as part of the Via Verde redevelopment team 2012
Big Apple Brownfield Award recipient as part of the Cornerstone B1 (LaTerraza) redevelopment team 2011

Years of Experience

Year started in company: 2013
Year started in industry: 1998

RELEVANT EXPERIENCE

Elton Crossing, Bronx, NY

AKRF provided environmental consulting services in connection with the purchase and redevelopment of the Elton Crossing site at 899 Elton Avenue in the Bronx, NY. The work initially involved the preparation of a Phase II subsurface investigation including soil and soil vapor testing to determine if the site would be eligible for the New York State Brownfield Cleanup Program (NYSBCP). Upon completion of the investigation, AKRF prepared a NYCBCP Application and the site was accepted into the NYSBCP. AKRF managed all aspects of the brownfield cleanup including; development of Investigation Work Plans, performing Remedial Investigations and Reports, preparation of Phase I ESAs, preparation of a Citizen Participation Plan, distribution of public notices, preparation and implementation of a Remedial Action Work Plan (RAWP), design of a sub-slab depressurization system, preparation of the Final Engineering Report and Site Management Plan, and sampling and management of soil disposal. AKRF is in the midst of implementing the Site Management Plan. As project manager, Ms. Shapiro was responsible for managing all technical components of the project, communication with NYSDEC and the Client, and managing the budget.

Second Farms, Bronx, NY

AKRF, Inc. was initially contracted by the New York City Office of Environmental Remediation (NYCOER) to conduct a subsurface investigation of a 1.12-acre parcel in the Bronx, New York under the United States Environmental Protection Agency (USEPA) Brownfield Assessment Grant program. The investigation included a geophysical survey and utility mark-outs, and the collection and analysis of soil, groundwater, soil vapor, indoor air and ambient air samples. AKRF continued working on the project for the developer by preparing a Remedial Action Plan and Environmental Assessment Statement. AKRF is in the midst of implementing the remedy.As project manager, Ms. Shapiro was responsible for managing all technical components of the project, communication with OER, NYCDEP, and the Client, and managing the budget.

Bradhurst Cornerstone II Residences, Manhattan, NY

AKRF, Inc. prepared a Part 58 Environmental Assessment and a City Environmental Quality Review Environmental Assessment Statement for the Bradhurst Cornerstone II Apartments project. Issues of concern for the environmental review included the identification of project commitments for certain of the four sites related to historic resources, hazardous materials, air quality, and building attenuation. As part of the mitigation of hazardous materials, AKRF conducted a Phase II investigation, and prepared a Remedial Action Plan and Construction Health and Safety Plan. As project manager, Ms. Shapiro was responsible for managing all technical components of the hazardous materials portion of the project, communication with the regulatory agency and the Client, and managing the budget.

Lambert Houses, Bronx, NY

AKRF performed an EIS of the Lambert Houses affordable housing complex located in the West Farms section of the Bronx, NY. Lambert Houses consisted of multi-story apartment buildings, parking garage, and a multi-tenant retail/commercial building alongside the elevated NYC subway. AKRF also conducted a Phase I ESA with a vapor intrusion screen of the Property to satisfy HUD’s vapor intrusion requirements. The Phase I and vapor intrusion screens were prepared in accordance with ASTM E1527-05, ASTM E2600, and EPA’s All Appropriate Inquiry (AAI) rule. After completion of the EIS, an E designation for hazardous materials was placed on the Site. A Subsurface Investigation was conducted and a Remedial Action Work Plan was prepared under OER oversight. The Site was subsequently entered in the NYC Voluntary Cleanup Program. AKRF is in the midst of implementing the RAWP, which included remediation of a hydraulic oil spill. As project manager, Ms. Shapiro was responsible for managing all technical components of the hazardous materials portion of the project, communication with the regulatory agency and the Client, and managing the budget.

Brook 156, Bronx, NY

AKRF was retained to provide environmental consulting services in connection with the purchase and development of the Site. AKRF prepared a Phase I Environmental Site Assessment (ESA) of the NYC-owned former gasoline service station and a former railroad. A Tier 1 Vapor Encroachment Screening was also conducted to satisfy HUD's vapor intrusion requirements. AKRF prepared a Remedial Investigation Work Plan (RIWP) and conducted a Remedial Investigation (RI) at the site, which included the collection and analysis of soil, soil vapor, and groundwater. The results of the RI, which were documented in a Remedial Investigation Report (RIR), were used to prepare a New York City Brownfield Cleanup Program (NYCBCP) application. The site was accepted into the New York State Brownfield Cleanup Program (NYSBCP). AKRF prepared a Citizen Participation Plan (CPP), distributed public notices, and conducted multiple Remedial Investigations to further investigate soil, soil vapor, and groundwater at the site prior to redevelopment. The results of the investigations were used to prepare a Remedial Action Work Plan (RAWP), which is undergoing review and approval by NYSDEC. The proposed remedy includes excavation of soil, design and installation of a soil vapor extraction system and sub-slab depressurization system, contingent groundwater treatment program, and installation of a vapor barrier and composite cover system. As project manager, Ms. Shapiro is responsible for managing all technical components of the project, communication with NYSDEC and the Client, and managing the budget.

On-Call Environmental Consulting Services (Various Locations), New York City Mayor's Office of Environmental Remediation (OER) (administered by NYCEDC)

Ms. Shapiro is managing an on-call contract with the OER for brownfields environmental assessment and remediation. The work has included conducting Phase I environmental site assessments (ESAs) and multi-media sampling of soil, groundwater, and soil vapor for various sites funded by EPA grants. The work plans and investigation reports were completed in accordance with OER and EPA requirements. AKRF also implemented a remedial plan for capping a park site in Staten Island. In addition, AKRF provided support to OER and an affordable housing developer to expedite an application for entry into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), as well as preparation and implementation of the remedial investigation and remedial plan.

Atlantic Chestnut, Brooklyn, NY

AKRF was retained to provide environmental consulting services in connection with the purchase and redevelopment of former burned manufacturing buildings encompassing an entire city block in Brooklyn, New York. As part of due diligence, AKRF prepared a Phase I Environmental Site Assessment (ESA) Report for the property. After acquisition, the property was divided into three separate sites (3264 Fulton Street, 235 Chestnut Street, and 3301 Atlantic Avenue). AKRF prepared a Subsurface (Phase II) Investigation Work Plans and conducted Phase IIs at each of the sites, which included the collection and analysis of soil, soil vapor, and groundwater samples. Based on the results of the Phase IIs, which were documented in Subsurface (Phase II) Reports, New York State Brownfield Cleanup Program (NYSBCP) applications were prepared for each of the sites. After acceptance into the NYSBCP, AKRF prepared Citizen Participation Plans (CPPs) and distributed public notices. AKRF prepared Remedial Investigation (RI) Work Plans (RIWPs) and implemented numerous Remediation Investigations for each of the sites to further investigate contaminated media at the site prior to redevelopment, and prepared the RI Reports (RIRs). AKRF is in the midst of preparing Interim Remedial Work Plans for each Site, which include installation of a Soil Vapor Extraction to prevent the off-site migration of contaminants. As project manager, Ms. Shapiro was responsible for managing all technical components of the project, communication with NYSDEC and the Client, and managing the budget.

SCOTT CAPORIZZO, EIT

TECHNICAL DIRECTOR

Scott Caporizzo, EIT, is a Technical Director in the Site Assessment and Remediation Department working out of the White Plains, New York office. Mr. Caporizzo provides project managerial services for projects requiring site assessment and remediation and regulatory compliance in the northeast. Mr. Caporizzo has experience managing projects with a range of regulatory agency oversight including New York State Department of Environmental Conservation (NYSDEC), New York City Department of Environmental Protection (NYCDEP), New York City (NYC) Mayor's Office of Environmental Remediation (OER), and the Environmental Protection Agency (EPA), especially projects within the NYS Brownfield Cleanup Program (BCP), NYC Voluntary Cleanup Program (VCP), and NYCOER's E-designation program. Mr. Caporizzo earned his bachelor's degree in environmental engineering from Lehigh University and through his career since holds extensive experience in conducting/managing various environmental investigations including Phase I ESAs, Phase IIs, and remedial investigations, as well as experience managing remedial action implementation and post-remedial action site monitoring. Mr. Caporizzo's experience includes media sampling programs, light/dense non-aqueous phase liquid (LNAPL/DNAPL) contamination delineation/remedial design, waste characterization and disposal coordination, long-term groundwater monitoring, and various other project and field manager duties. Mr. Caporizzo has a strong working knowledge of New York and New Jersey state and federal environmental regulations and compliance guidelines, as well as industry-wide assessment and remediation practices.

BACKGROUND

Education

B.S., Environmental Engineering, Lehigh University, 2013

Licenses/Certifications

Engineer-in-Training, NY

OSHA 40 Hour HAZWOPER

OSHA 8 Hour Refresher

OSHA 10 Hour Construction Safety & Health Course DEC 4 Hour Erosion and Sediment Control (E&SC), New York State Department of Environmental Conservation

Years of Experience

9 years in the industry
2 year with AKRF

RELEVANT EXPERIENCE

Former Excelsior Bag, NYSDEC BCP Site, Yonkers, NY

Mr. Caporizzo serves as the project manager for the Former Excelsior Bag BCP Site in Yonkers, New York. Mr. Caporizzo's experience has included client and NYSDEC coordination services, and has directly supervised the on-site remedial investigation program. The project has included ongoing management of remedial investigation and remedial design components, including delineation and remedial design of a DNAPL identified in the subsurface fill materials. Mr. Caporizzo's responsibilities included drafting the Remedial Investigation Work Plan (RIWP), the Remedial Investigation Report (RIR), and several other supplemental investigation work plans and reports for submission to NYSDEC. The ongoing investigation has included extensive soil, groundwater, and soil vapor sampling, including the utilization of laser-induced fluorescence (LIF) drilling technologies (specifically, TarGOST) and confirmatory soil borings to delineate the nature and extent of the DNAPL-impacted soil. Mr. Caporizzo's responsibilities as project manager also include coordination with the NYSDEC BCP Project Manager, the redevelopment design team, and review of contractor submittals.

1477 Macombs Road, NYC OER E-Designation Site, Bronx, NY

Mr. Caporizzo serves as the project manager for the 1477 Macombs Road Site in the Bronx, New York. Mr. Caporizzo's experience has included client and NYC OER coordination services, and has directly supervised the on-site remedial investigation and remedial action implementation during construction. Mr. Caporizzo's responsibilities included drafting the Phase II (Subsurface) Investigation, RIR, and Remedial Action Work Plan (RAWP) for submission to NYC OER. The remedial investigation and design included soil, groundwater, and soil vapor sampling, excavation/management of urban fill, and design of an active sub-slab depressurization system (SSDS) for the active mitigation of chlorinated volatile organic compounds documented in on-site soil vapor. Mr. Caporizzo's responsibilities as project manager also included coordination with NYC OER Project Manager, the NYC Clean Soil Bank for import of clean fill materials during construction, the redevelopment design team, and review of contractor submittals.

Former General Motors Assembly Plant, NYSDEC BCP Site, Sleepy Hollow, NY

Mr. Caporizzo served as the project manager for a client developing a lot within a larger BCP Site (i.e., the Former General Motors Assembly Plant BCP Site in Sleepy Hollow, New York). Mr. Caporizzo provides a project managerial role for on-site Site Management Plan (SMP)-compliance oversight services. Mr. Caporizzo's responsibilities included ensuring that all requirements of the SMP were met during construction, including soil screening for reuse/disposal, waste characterization sampling, documenting the installation of a SSDS, and documenting the installation of the final cover system (including the building slab vapor barrier). Mr. Caporizzo's responsibilities as project manager also included review of contractor RFIs and submittals, review of on-site field personnel daily reports/operations, and preparation of various submittals as required per the SMP. Mr. Caporizzo also directly coordinated with the BCP Remedial Party (RP), the RPs Environmental Engineer, NYSDEC, and New York State Department of Health (NYSDOH), and drafted the Construction Completion Report (CCR) which documented that all SMP-compliance requirements were met during construction.

Polychrome East & West, NYCDEC BCP Sites, Yonkers, NY

Prior to joining AKRF, Caporizzo provided field oversight and work plan preparation services for the Polychrome East and West BCP Sites in Yonkers, NY. Mr. Caporizzo provided remedial investigation oversight services to determine the nature and extent of subsurface contamination in soil, groundwater, and soil vapor. Areas of DNAPL and LNAPL were also identified on-site. Mr. Caporizzo also provided pre-design investigation oversight services for the pre-design investigation (PDI) which utilized LIF drilling technologies (specifically, TarGOST) and confirmatory soil borings to delineate the nature and extent of the DNAPL-impacted soil. Mr. Caporizzo additionally contributed to the preparation of the RAWPs. The sites' remedial approach included in-situ soil solidification (ISS) of DNAPL plumes. Since joining AKRF, Mr. Caporizzo served as a lead author for the preparation of the SMPs and the Final Engineering Reports (FER) prepared after the completion of remedial action.

Former BICC Cables Site, NYCDEC BCP Site, Yonkers, NY

While at a previous firm, Mr. Caporizzo provided both project manager and field oversight services for the former BICC BCP Site in Yonkers, NY. Mr. Caporizzo provided remediation oversight services during dredging and sediment cover system (SCS) installation efforts for approximately 4,500 cubic yards of PCB impacted Hudson River sediments located below an H-pile-supported building slab that were characterized as hazardous under the Toxic Substances Control Act (TSCA) regulated by the EPA. This multi-layer SCS, among other engineering controls installed at the site, was maintained under a SMP. Upon the issuance of the site's Certificate of Completion in April 2017, Mr. Caporizzo's responsibilities as the project manager included executing semi-annual groundwater monitoring events, an annual site-wide inspection of the site's engineering controls, fill import material sampling/review, and NYSDEC, EPA, and client coordination.

GREGORY D. BAIRD

SENIOR ENVIRONMENTAL SCIENTIST

Mr. Baird is a Senior Environmental Scientist with over 15 years of professional environmental consulting and contracting experience. His range of expertise includes: remediation oversight, planning and conducting environmental sampling programs (subsurface soil investigations, waste characterization sampling, groundwater monitoring, and indoor air quality/vapor intrusion surveys), underground storage tank inspections and closure oversight, and potable water sampling. Mr. Baird also conducts comprehensive asbestos and lead-based paint surveys, prepares asbestos and hazardous materials removal specifications, and manages air monitoring services for asbestos abatement projects.

BACKGROUND

Education

B.S., Geology, State University of New York at New Paltz, New York, 2004

Licenses/Certifications

40 Hour Hazardous Waste Operations Site Worker, 2005
NYC Certified Asbestos Investigator, 2012
Asbestos Inspector, 2008
Asbestos Project Monitor, Air Technician and Inspector, 2008
Lead Risk Assessor, 2009
Lead Based Paint Risk Assessor and Inspector, 2009
Erosion and Sediment Control Site Inspector, 2009
Confined Space Entry, 2006

Years of Experience

Year Started in Company: 2006
Year Started in Industry: 2004

RELEVANT EXPERIENCE

New York City School Construction Authority: On-Call Environmental Consulting

Under an on-call contract, AKRF provides the New York City School Construction Authority (NYCSCA) with hazardous materials consulting services and oversees plumbing disinfection work and lead in drinking water sampling. As the environmental scientist, Mr. Baird plans and conducts various due diligence and environmental assessment tasks including Phase II (Subsurface) Environmental Site Investigations (soil, groundwater and soil gas investigations); Indoor Air Quality (IAQ) and Vapor Intrusion (VI) Assessments; and Underground Storage Tank (UST) investigations. As the assistant Project Manager for the lead in drinking water and plumbing disinfection tasks, Mr. Baird provides provide lead sampling, reporting and remedial recommendations, reviewing and commenting on disinfection plans, supervision of the disinfection and confirmation testing, and preparation of reports documenting the work was conducted in accordance with the specifications and applicable requirements.

Willets Point Demolition, Queens, NY

AKRF supported the New York City Economic Development Corporation (EDC) with Phase 1 of the Willets Point Redevelopment Plan, which includes the demolition of existing structures. As the environmental scientist, Mr. Baird performed pre-demolition asbestos-containing materials, lead paint and universal waste surveys of approximately 70 structures throughout the 23-acre area site. Mr. Baird prepared lead paint and universal waste specifications, and attended asbestos contractor site visits. As the asbestos project manager, Mr. Baird oversaw the WBE sub-consultant field staff during air monitoring of asbestos abatement of the structures.

Randolph Houses, NYCHA/Trinity West Harlem Development

NYCHA retained AKRF to provide cultural resources consulting services in compliance with Section 106 of the National Historic Preservation Act for the proposed redevelopment/reuse of the Asa Philip Randolph Houses on West 114th Street in Manhattan. These tenements are eligible for listing on the State/National Register of Historic Places by the New York State Historic Preservation Office (SHPO) as part of the West 114th Street Historic District. For the developer (Trinity), AKRF prepared a Phase I Environmental Site Assessment, a Phase II subsurface investigation, a Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP), and performed asbestos and lead-paint surveys of the 36 buildings, and prepared asbestos, lead-paint and hazardous materials specification sections. As the environmental scientist, Mr. Baird performed asbestos and lead \surveys, and prepared reports and specification sections for asbestos, lead, and hazardous materials phases.

Mt. Sinai Health System, Manhattan, NY

Mt. Sinai is extensively renovating several buildings at their Beth Israel and New York Eye and Ear Infirmary locations. Prior to the renovations, as the environmental scientist, Mr. Baird performed comprehensive asbestos surveys of approximately 250,000 square feet of floor space.

Adelaar Resort, Thompson, NY

As part of a multi-disciplinary team, AKRF provided construction administration, inspection and oversight to support construction activities for the EPT Concord Resort, a 1,583 acre destination resort community located in the Town of Thompson, New York. As the environmental scientist, Mr. Baird conducted bi-weekly Stormwater Pollution Prevention Plan (SWPPP) compliance inspections and provide stabilization figures for DEC permit requirements. This effort involved coordinating with the on-site Contractors and project managers.

Memorial Sloan-Kettering Cancer Center (MSKCC), Manhattan, NY

Memorial Sloan Kettering Cancer Center constructed an outpatient center for patients on three floor of the 26-story high-rise building located at 16 East 60th Street in Manhattan, NY. Prior to gut-renovation of the cellar, third, and fourth floors, AKRF performed a comprehensive asbestos survey. AKRF prepared the specifications for asbestos abatement, coordinated with Turner Construction Company and performed asbestos project air monitoring during abatement of the occupied building. As the project manager, Mr. Baird conducted the ACM survey, performed project monitoring during abatement and management of field staff during air monitoring.

Hudson River Park, Pier 40, Manhattan, NY

AKRF led a consultant team in preparing an EIS and providing additional support services for Hudson River Park, a five-mile linear park that is revitalizing Manhattan’s west side waterfront from 59th Street to the. As the environmental scientist, Mr. Baird conducted multiple ACM surveys throughout the Park. Mr. Baird also performed asbestos project monitoring during abatement of various areas and project management of field staff during asbestos abatement air monitoring.

United States Tennis Association (USTA), Queens, NY

AKRF was retained by the United States Tennis Association (USTA) to prepare environmental studies for the $254 million expansion of the National Tennis Center at Flushing Meadows-Corona Park. Prior to the planned demolition, as the environmental scientist, Mr. Baird performed a comprehensive asbestos survey of the 20,000-seat Louis Armstrong stadium to identify and quantify ACM.

Yankee Stadium Demolition, Bronx, NY

The New York City Economic Development Corporation (NYCEDC) project included the demolition of the old Yankee Stadium and construction of a ball field known as Heritage Field. As the environmental scientist, Mr. Baird provided air monitoring and remedial action plan (RAP) oversight during the demolition and soil disturbance work.

Roosevelt New Middle School, Roosevelt, NY

AKRF was retained by the Roosevelt Union Free School District to oversee remediation of a former Nassau Count Department of Public Works Pesticide Mixing Facility. As the environmental scientist, Mr. Baird oversaw remediation activities, which included excavation and disposal of contaminated soil. He also performed soil sample collection, groundwater and air monitoring, and prepared remedial action work documents. In addition to remedial oversight, the work also involved coordinating with the construction managers and subcontractors.

Gedney Way Landfill, White Plains, NY

AKRF directed the remediation and landfill closure project at the existing composting facility in White Plains, NY. As the environmental scientist, Mr. Baird directed contractors during the installation of monitoring wells and soil gas sampling points, and collected soil, groundwater, and soil gas samples to fulfill the investigation requirements, including documentation of the extent of landfill material and a solvent groundwater plume. During landfill closure, Mr. Baird performed contractor oversight to document that the landfill closure work was in compliance with the NYSDEC-approved Landfill Closure Plan. Oversight activities included documenting the construction of the landfill cap elements, performing work space monitoring in accordance with the Health and Safety Plan, and implementing the community air monitoring requirements.

AvalonBay, West Chelsea, Manhattan, NY

Investigation and remediation of this former warehouse and auto-repair facility was conducted under the New York City Office of Environmental Remediation (OER) E-designation program. AKRF provided environmental oversight during implementation of the Remedial Action Plan (RAP) for the site. As the environmental scientist, Mr. Baird oversaw remediation activities, which included excavation and disposal of petroleum contaminated soils, conduct air monitoring, and prepare daily reports for submittal to the OER project manager.

CLAIRE BEARDEN

PROFESSIONAL II

Claire Bearden is an Environmental Scientist in AKRF's Hazardous Materials Department with experience in preparing Phase I environmental site assessments, Phase II Site Investigations, Remedial Investigations, and technical reporting.

BACKGROUND

Education

BS, Syracuse University, Earth Science with Environmental Focus, 2016

Licenses/Certifications

OSHA 10-hour Construction Industry,
OSHA 40-hour HAZWOPER Certified,
OSHA 8-Hour Supervisor Training Certified,

Professional Memberships

Programs Committee Member, Society of Women Environmental Professionals, NJSWEP Programs Committee

Years of Experience

4 years in the industry
1 years with AKRF

RELEVANT EXPERIENCE

New York State Regional Food Hub - Hunts Point, Bronx

Ms. Bearden performed remedial construction oversight to satisfy NYSDEC Brownfield Cleanup Program (BCP) program requirements during the initial redevelopment stages of a former Manufactured Gas Plant (MGP) facility. Ms. Bearden's duties have included administering a Community Air Monitoring Program (CAMP) with continuous data collection and automated telemetry for airborne particulates and volatile organics during remedial activities. Ms. Bearden has completed progress reporting for NYSDEC, and assisted with the collection of soil and concrete samples proposed for reuse and/or off-site disposal during the redevelopment.

New Jersey Transit Raritan Rail Yard Site Investigation – Raritan, NJ

AKRF is performing a Site Investigation under New Jersey Department of Environmental Protection (NJDEP's) Site Remediation Program to evaluate several historic petroleum releases at this active rail yard. Ms. Bearden has been responsible for conducting preliminary review of historic investigation activities on file with NJ Transit dating back to the early 1980s. Ms Bearden has also submitted requests to NJDEP to review regulatory files for active and inactive remedial cases on and adjacent to the site. As part of the initial phase of the site investigation, Ms. Bearden completed rail safety training and helped retrieve passive soil gas samplers at the site

Bolivar Development LLC, 1000-1006 Westchester Avenue, NY

A new commercial and community building is planned for 1000-1006 Westchester Avenue in the Bronx, including a Democracy Prep Public Schools charter school. AKRF is providing site assessment/remediation and civil engineering services for the project. Ms. Bearden drafted the waste classification report for this project.

CLAIRE BEARDEN

PROFESSIONAL II

Bolivar Development LLC, 1941 & 1959 Jerome Avenue, Bronx, NY

AKRF conducted a Supplemental Remedial Investigation (RI) on behalf of the Client to support an application to the NYSDEC Brownfield Cleanup Program (BCP) for this automotive facility in the Bronx. Ms. Bearden logged soils cores and collected soil vapor, soil and groundwater samples.

Hunters Point South Towers, Queens, NY

AKRF is currently providing environmental planning and transportation services on a technical memorandum to support an update development program from the Hunters Point South FEIS. Proposed new schools on Parcel C and Parcel F have necessitated that AKRF develop and conduct transportation screening analyses, parking studies, and auto ownership surveys to assess whether the proposed modifications would create additional impacts when compared to the original FEIS. AKRF is coordinating these services with various City agencies including NYCEDC, MOEC, HPD, DCP, and DOT. AKRF developed a streamlined process for assessing traffic and pedestrian impacts that will result in an accelerated schedule and less overall effort compared with conducting new traffic studies at intersections previously analyzed in the FEIS.

Ms. Bearden performed construction oversight and air monitoring during the excavation work required for installation of utilities in the courtyard. For this project, Claire screened and oversaw the trenching and stockpiling of soil as a representative of the generator. She also performed a Air Monitoring Program for airborne particulates and VOCs during soil handling activities.

167 North Broadway, Yonkers, NY

Ms. Bearden performed remedial construction oversight for a structurally complicated 20-foot-deep excavation, which required a sliding rail shoring system for support of excavation to protect adjacent buildings and structures. Ms. Bearden responsibilities included direct oversight of the contractor performing the excavation, implementation of community air monitoring, and collection of post-excavation end point samples. Upon completion of the remediation, Ms. Bearden drafted the remedial action report for submission to NYSDEC.

Extell Former Excelsior Bag, Yonkers, NY

AKRF conducted a Remedial Investigation (RI) on behalf of the Client as part of the requirements for their application to the NYSDEC Brownfield Cleanup Program (BCP) for this former manufacturing facility in Yonkers. Ms. Bearden collected soil vapor and groundwater samples.

APPENDIX B

HEALTH AND SAFETY PLAN AND COMMUNITY AIR MONITORING PLAN

350 RISING

350 GRAND CONCOURSE
BRONX, NEW YORK

Health and Safety Plan and Community Air Monitoring Plan

NYSDEC BCP Site #: C203153
AKRF Project Number: 210258

Prepared For:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau B
625 Broadway, 12th Floor
Albany, New York 12233

Prepared On Behalf Of:

350 Rising LLC
450 West 14th Street, 8th Floor
New York, New York 10014

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
212-696-0670

JUNE 2022

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FIGURES

APPENDICES

1.0 INTRODUCTION

This environmental Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) has been developed for the implementation of a Remedial Investigation (RI) conducted by all personnel on-site at 350 Grand Concourse in the Bronx, New York (the Site). The Site is identified on the New York City Tax Map as Bronx Borough Tax Block 2341, Lot 42. Historically, Lot 42 was divided into Lots 42 and 47; Lot 47 is associated with the historical address 370 Grand Concourse, Bronx, NY.

The Site includes an approximately 31,045-square-foot (sf) concrete-paved vacant gasoline service station with a boarded up one-story convenience store, a sales kiosk, and a canopy covered former gasoline pump dispenser area. All pump dispensers have been removed. The Site is bounded to the north by a three-story residential building and a five-story apartment building, followed by East 144th Street; to the east by a wooded vacant lot, followed by Metro North Railroad tracks; to the south by a multi-story residential building, followed by various automotive repair shops; and to the west by Grand Concourse, followed by a U-Haul Storage and Moving facility. The surrounding area consists primarily of automotive, commercial, transit, and residential uses. A Site Location map is provided as Figure 1.

An October 2021 Subsurface (Phase II) Investigation Report prepared for the Site by AKRF concluded that there are elevated concentrations of petroleum volatile organic compounds (VOCs), metals, and polycyclic aromatic hydrocarbons (PAHs) in soil, VOCs and metals in groundwater, and petroleum- and chlorinated solvent-related compounds in soil vapor at the Site. The RI—in conjunction with an Interim Remedial Measure (IRM) to remove the pump islands, canopy, convenience store, underground storage tanks (USTs), and associated piping, vents, and fill ports—will consist of the collection of soil, groundwater, and soil vapor samples to define the nature and extent of contamination in on-site soil, groundwater, and soil vapor.

This HASP and CAMP does not discuss routine health and safety issues common to general construction and excavation, including but not limited to slips, trips, falls, shoring, and other physical hazards. All AKRF employees are directed that all work must be performed in accordance with AKRF's Generic HASP and all Occupation Safety and Health Administration (OSHA)-applicable regulations for the work activities required for the project. All project personnel are furthermore directed that they are not permitted to enter Permit Required Confined Spaces (as defined by OSHA). For issues unrelated to contaminated materials, all non-AKRF employees are to be bound by all applicable OSHA regulations, as well as any more stringent requirements specified by their employer in their corporate HASP or otherwise. AKRF is not responsible for providing oversight for issues unrelated to contaminated materials for non-employees. This oversight shall be the responsibility of the employer of that worker or other official designated by that employer.

2.0 HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 Hazard Evaluation

2.1.1 Hazards of Concern

Check all that apply		
(**X**) Organic Chemicals	(**X**) Inorganic Chemicals	( ) Radiological
( ) Biological	( ) Explosive/Flammable	( ) Oxygen Deficient Atm.
(**X**) Heat Stress	(**X**) Cold Stress	( ) Carbon Monoxide
Comments: No personnel are permitted to enter permit confined spaces.		

2.1.2 Physical Characteristics

Check all that apply		
(**X**) Liquid	(**X**) Solid	( ) Sludge
(**X**) Vapors	( ) Unknown	( ) Other

2.1.3 Hazardous Materials

Check all that apply					
Chemicals	**Solids**	**Sludges**	**Solvents**	**Oils**	**Other**
( ) Acids	( ) Ash	( ) Paints	( ) Halogens	( ) Transformer	( ) Lab
( ) Caustics	( ) Asbestos	( ) Metals	(**X**) Petroleum	( ) Dielectric	( ) Pharmaceutical
(**X**) Pesticides	( ) Tailings		(**X**) Other: Chlorinated	(**X**) Motor or Hydraulic Oil	( ) Hospital
(**X**) Petroleum	(**X**) Other: Fill material			(**X**) Gasoline	( ) Radiological
( ) Inks				(**X**) Fuel Oil	( ) MGP
(**X**) PCBs					( ) Mold
(**X**) Metals					( ) Cyanide
(**X**)Other: VOCs & SVOCs					
Notes: VOCs – Volatile Organic Compounds SVOCs – Semivolatile Organic Compounds MGP – Manufactured Gas Plant					

2.1.4 Chemicals of Concern

Chemicals	**REL/PEL/STEL**	**Health Hazards**
Arsenic	REL = 0.002 mg/m^3 PEL = 0.010 mg/m^3	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [potential occupational carcinogen]
Barium	REL = 0.5 mg/m^3 PEL = 0.5 mg/m^3	Irritation of eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia.
Benzene	REL = 0.1 ppm PEL = 1 ppm STEL = 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; bone marrow depression, potential occupational carcinogen.
Cadmium	PEL = 0.005 mg/m^3	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].
Copper	REL = 1 mg/m^3 PEL = 1 mg/m^3	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis.
Chromium	REL = 0.5 mg/m^3 PEL = 0.5 mg/m^3	Irritation eyes, skin; sensitization dermatitis; lung fibrosis (histologic)
Pesticides	REL = 0.5 mg/m^3 PEL = 1 mg/m^3 [skin]	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; potential carcinogen.
Dieldrin	REL = 0.25 mg/m^3 [skin] PEL = 0.25 mg/m^3 [skin]	Headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; [potential occupational carcinogen].
Ethylbenzene	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma.
Fuel Oil	REL = 350 mg/m^3 PEL = 400 ppm	Nausea, irritation – eyes, hypertension, headache, light-headedness, loss of appetite, poor coordination; long-term exposure – kidney damage, blood clotting problems; potential carcinogen.
Lead	REL = 0.1 mg/m^3 PEL = 0.05 mg/m^3	Weakness, lassitude, insomnia; facial pallor, pale eye, anorexia, low-weight, malnutrition, constipation, abdominal pain, colic; anemia; gingival lead line; tremors, paralysis wrists and ankles; encephalopathy; kidney disease; irritation eyes; hypotension.
Manganese	REL = 1 mg/m^3 PEL = 5 mg/m^3 STEL = 3 mg/m^3	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; lower back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage.

Chemicals	**REL/PEL/STEL**	**Health Hazards**
Mercury	REL = 0.1 mg/m^3 PEL = 0.05 mg/m^3	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria.
Naphthalene	REL = 15 ppm PEL = 10 ppm	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage.
Nickel	REL = 0.015 mg/m^3 PEL = 1 mg/m^3	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen].
PCBs	PCB-1242: REL = 1 mg/m^3 PEL = 0.001 mg/m^3 PCB-1254: REL = 0.5 mg/m^3 PEL = 0.001 mg/m^3	Rash; anemia, liver, stomach, thyroid damage; reduced ability to fight disease; impaired reproduction.
Polycyclic Aromatic Hydrocarbons (PAHs)	PEL = 5 mg/m^3	Harmful effects to skin, bodily fluids, and ability to fight disease, reproductive problems; [potential occupational carcinogen].
Tetrachloroethylene (PCE)	PEL = 100 ppm STEL = 200 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, poor coordination; headache, drowsiness; skin erythema (skin redness); liver damage; potential occupational carcinogen.
Toluene	REL = 100 ppm PEL = 200 ppm STEL = 300 ppm	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Trichloroethylene (TCE)	PEL = 100 ppm	Lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen].
Xylenes	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, poor coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Zinc	REL = 5 mg/m^3 (dust and fume) PEL = 5 mg/m^3 (fume) 15 mg/m^3 (total dust) 5 mg/m^3 (respirable dust)	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.
Comments: REL = National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit PEL = OSHA Permissible Exposure Limit STEL = OSHA Short Term Exposure Limit		

2.2 Designated Personnel

AKRF will appoint one of its on-site personnel as the Site Safety Officer (SSO). This individual will be responsible for the implementation of the HASP. The SSO will have a 2-year or 4-year college degree in occupational safety or a related environmental science/engineering field, and experience in implementation of air monitoring and hazardous materials sampling programs. Health and safety training required for the SSO and all field personnel is outlined in Section 2.3 of this HASP.

2.3 Training

All personnel who enter the work area while intrusive activities are being performed will have completed a 40-hour training course that meets OSHA requirements of 29 Code of Federal Regulations (CFR) Part 1910, Occupational Safety and Health Standards. In addition, all personnel will have up-to-date 8-hour refresher training. The training will allow personnel to recognize and understand the potential hazards to health and safety. All field personnel must attend a training program, whose purpose is to:

- Make them aware of the potential hazards they may encounter;
- Provide the knowledge and skills necessary for them to perform the work with minimal risk to health and safety;
- Make them aware of the purpose and limitations of safety equipment; and
- Ensure that they can safely avoid or escape from emergencies.

Each member of the field crew will be instructed in these objectives before work begins. A Site safety meeting will be conducted at the start of the project. Additional meetings shall be conducted, as necessary, for new personnel working at the Site.

2.4 Medical Surveillance Program

All AKRF and subcontractor personnel performing field work involving subsurface disturbance at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120 (f). A physician’s medical release for work will be confirmed by the SSO before an employee can begin Site activities. The medical release shall consider the type of work to be performed and the required personal protective equipment (PPE). The medical examination will, at a minimum, be provided annually and upon termination of hazardous waste Site work.

2.5 Site Work Zones

During any activities involving subsurface disturbance, the work area must be divided into various zones to prevent the spread of contamination, ensure that proper protective equipment is donned, and provide an area for decontamination.

The Exclusion Zone is defined as the area where exposure to impacted media could be encountered. The Contamination Reduction Zone (CRZ) is the area where decontamination procedures take place and is located next to the Exclusion Zone. The Support Zone is the zone area where support facilities such as vehicles, a fire extinguisher, and first aid supplies are located. The emergency staging area (part of the Support Zone) is the area where all workers on-site would assemble in the event of an emergency. A summary of these areas is provided below. These zones may be changed by the SSO, depending on that day’s activities. All field personnel will be informed of the location of these zones before work begins.

Task	Exclusion Zone	CRZ	Support Zone
Remedial Investigation	10 feet from drill rig	25 feet from drill rig	As Needed
Comments: Control measures such as caution tape and/or traffic cones will be placed around the perimeter of the work area when work is being done in a public area.			

2.6 Community Air Monitoring Plan

The purpose of the air monitoring program is to identify any exposure of the field personnel and the community to potential environmental hazards in the soil and groundwater. Air Monitoring will be conducted in accordance with the New York State Department of Health (NYSDOH) and New York State Department of Environmental Conservation (NYSDEC) guidance. Results of the air monitoring will be used to determine the appropriate response action, if needed.

Demolition of the Site building, canopy, and pump islands is expected to occur as part of the IRM, prior to NYSDEC approval of the Remedial Action Work Plan (RAWP). As such, 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. NYSDEC will determine these requirements in consultation with NYSDOH.

2.6.1 VOC Monitoring

Continuous monitoring for VOCs will be conducted during all ground-intrusive activities, including soil boring advancement and groundwater monitoring well installation. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. VOCs will be monitored continuously at the downwind perimeter of the Exclusion Zone. Monitoring will be conducted with a photoionization detector (PID) equipped with an 10.6 electron Volt (eV) lamp capable of calculating 15-minute running average concentrations.

More frequent intervals of monitoring will be conducted if required as determined by the SSO. All PID readings will be recorded and available for NYSDEC and NYSDOH personnel to review. Instantaneous readings, if any, will also be recorded.

2.6.2 Particulate Monitoring

Continuous monitoring for particulates will be conducted during all ground-intrusive activities, which will involve the measurement of respirable dust. Community air monitoring for dust particulates will be conducted using an MIE 1000 Personal DataRam or equivalent to measure the concentration of airborne respirable particulates less than 10 micrometers in size (PM_{10}). The dust monitor will be capable of calculating 15-minute running average concentrations and equipped with an audible alarm to indicate exceedance of action levels. Background readings and any readings that trigger response actions will be recorded in the project logbook, which will be available on-site for NYSDOH and/or NYSDEC review.

2.6.3 Community Air Monitoring Action Levels

VOC Action Levels

The following actions will be taken based on organic vapor levels measured:

- If total organic vapor levels exceed 5 parts per million (ppm) above background for the 15-minute average at the Exclusion Zone perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the Exclusion Zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the hot 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 above background for the 15-minute average.
- If the total organic vapor level is above 25 ppm at the perimeter of the Exclusion Zone, activities will be shutdown.

Particulate Action Levels

The following actions will be taken based on particulate levels measured:

- If the downwind particulate concentrations are greater than 100 micrograms per cubic meter ($\mu g/m^3$) above background (upwind concentrations), and no other obvious source is apparent, then it will be assumed that the elevated particulate concentrations are a result of Site activities. In such instances, dust suppression measures will be implemented and monitoring will be continued. Work will be allowed to continue with dust suppression if downwind particulate levels do not exceed 150 $\mu g/m^3$ above the background (upwind concentration) and provided that no visible dust is migrating from the work area.
- If particulate levels persist at 150 $\mu g/m^3$ above the background, work must be stopped until dust suppression measures bring particulate levels to below 150 $\mu g/m^3$ above background.

Major Vapor Emission Response Plan

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the Site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or vapor controls must be implemented.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the Exclusion Zone, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If either of the following criteria is exceeded in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be implemented:

- Sustained organic vapor levels approaching 1 ppm above background for a period of more than 30 minutes; or
- Organic vapor levels greater than 5 ppm above background for any time period.

Upon activation, the following activities shall be undertaken as part of the Major Vapor Emission Response Plan:

- NYSDEC, NYSDOH, and local police authorities will be immediately contacted by the SSO and advised of the situation;
- Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the SSO; and
- All emergency contacts will go into effect as appropriate.

All readings will be recorded and available for NYSDEC and NYSDOH personnel to review.

2.7 Personal Protection Equipment (PPE)

The PPE required for various kinds of Site investigation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, Appendix B, "General Description and Discussion of the Levels of Protection and Protective Gear."

AKRF field personnel and other Site personnel shall wear, at a minimum, Level D personal protective equipment. The protection will be based on the air monitoring described in Section 2.6.

LEVEL OF PROTECTION & PPE		**Drilling/Sampling**
Level D (**X**) Steel Toe Shoes (**X**) Hard Hat (within 25 feet of drill rig) (**X**) Work Gloves	(**X**) Safety Glasses ( ) Face Shield (**X**) Ear Plugs (within 25 feet of drill rig) (**X**) Nitrile Gloves (**X**) Tyvek for drill rig operator if NAPL present	Yes
Level C ***(in addition to Level D)*** (**X**) Half-Face Respirator OR (**X**) Full Face Respirator ( ) Full-Face PAPR	( ) Particulate Cartridge ( ) Organic Cartridge (**X**) Dual Organic/ Particulate Cartridge	If PID > 10 ppm (breathing zone)
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breathe or any odors detected). NAPL – Non-aqueous Phase Liquid PAPR – Powdered Air Purifying Respirator		

2.8 General Work Practices

To protect the health and safety of the field personnel, field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the Site. These areas will be designated by the SSO.
- Workers must wash their hands thoroughly on leaving the work area and before eating, drinking, or any other such activity.

- The workers should shower as soon as possible after leaving the Site. Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat/cold stress.

3.0 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN

The field crew will be equipped with emergency equipment, such as a first aid kit and disposable eye washes. In the case of a medical emergency, the SSO will determine the nature of the emergency and he/she will have someone call for an ambulance, if needed. If the nature of the injury is not serious (i.e., the person can be moved without expert emergency medical personnel), he/she should be taken to a hospital by on-site personnel. Directions to the hospital are provided below, and a hospital route map is included as Figure 2.

3.1 Hospital Directions

Hospital Name:	Lincoln Medical Center – Emergency Room
Phone Number:	(718) 579-5000
Address:	234 East 149th Street, Bronx, NY 10451
Directions:	1. Turn right out of the Site, heading north on Grand Concourse. 2. Turn right onto East 144th Street. 3. Turn left onto Park Avenue. 4. Turn right onto East 149th Street. 5. The emergency room entrance will be on the right.

3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Deborah Shapiro, QEP	Quality Assurance/Quality Control Officer	646-388-9544 (office)
	Scott Caporizzo	Project Manager	914-922-2354 (office)
	Greg Baird	Deputy Project Manager	914-922-2372 (office)
	Claire Bearden	Field Team Leader/ SSO	336-266-9330 (cell)
350 Rising LLC	Peter Fine	Client Representative	212-620-0500 (office)
Ambulance, Fire Department & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	800-457-7362

4.0 APPROVAL & ACKNOWLEDGMENTS OF HASP

APPROVAL

Signed: ____________________________________ Date: ______________________________________

AKRF Project Manager

Signed: ____________________________________ Date: ______________________________________

AKRF SSO

Below is an affidavit that must be signed by all workers who enter the site. A copy of the HASP must be on-site at all times and will be kept by the SSO.

AFFIDAVIT

I,_________________________(name), of_______________________________(company name), have read the Health and Safety Plan (HASP) for the 350 Grand Concourse site located at 350 Grand Concourse in the Bronx, New York. I agree to conduct all on-site work in accordance with the requirements set forth in this HASP and understand that failure to comply with this HASP could lead to my removal from the site.

Signed: ___________________________ Company: ________________________ Date: _________
Signed: ___________________________ Company: ________________________ Date: _________
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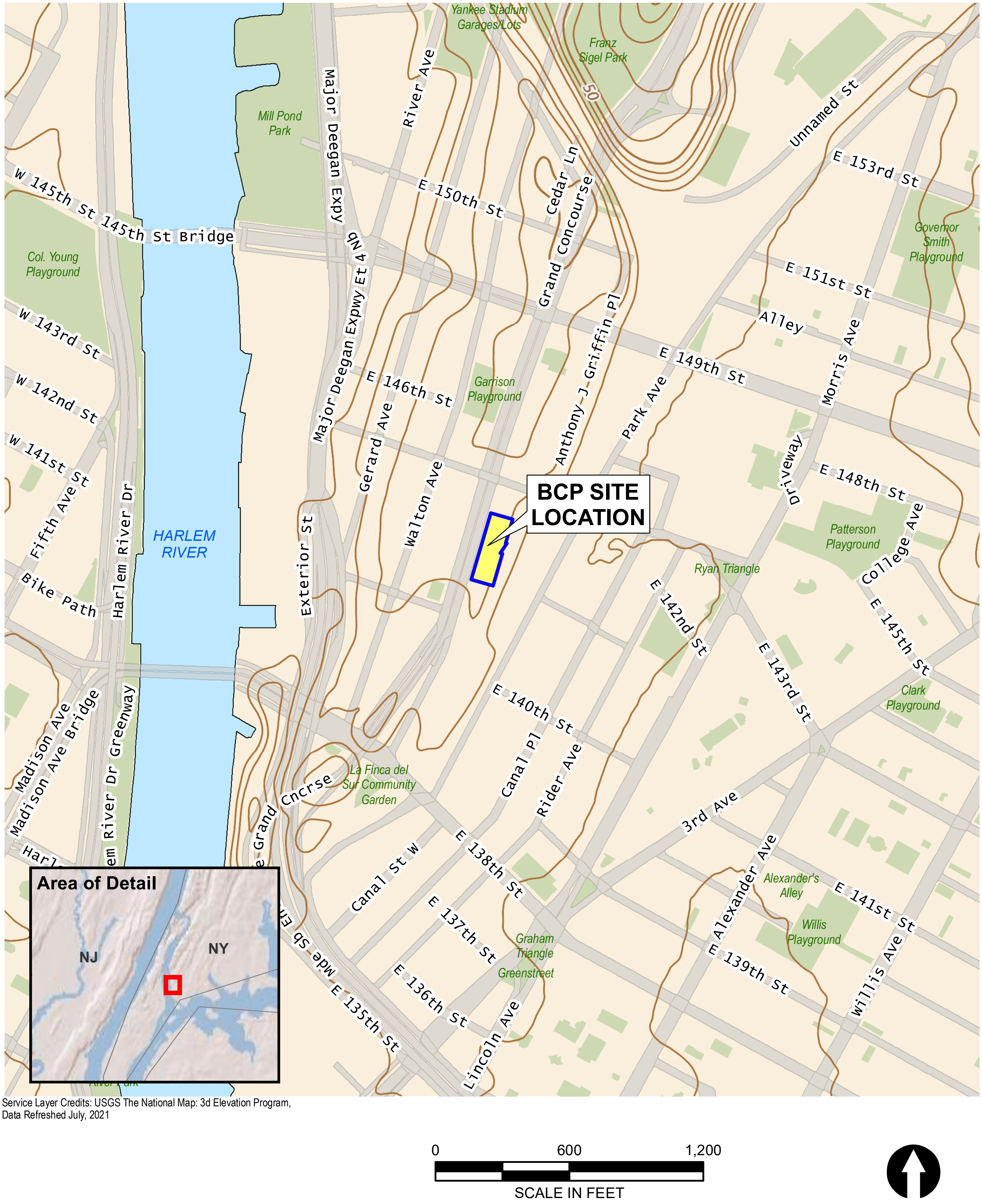
FIGURE 1

SITE LOCATION



Service Layer Credits: USGS The National Map: 3d Elevation Program, Data Refreshed July, 2021

AKRF
440 Park Avenue South, New York, NY 10016

350 Grand Concourse
Bronx, New York

BCP SITE LOCATION

DATE
11/19/2021

PROJECT NO.
210258

FIGURE
1

FIGURE 2

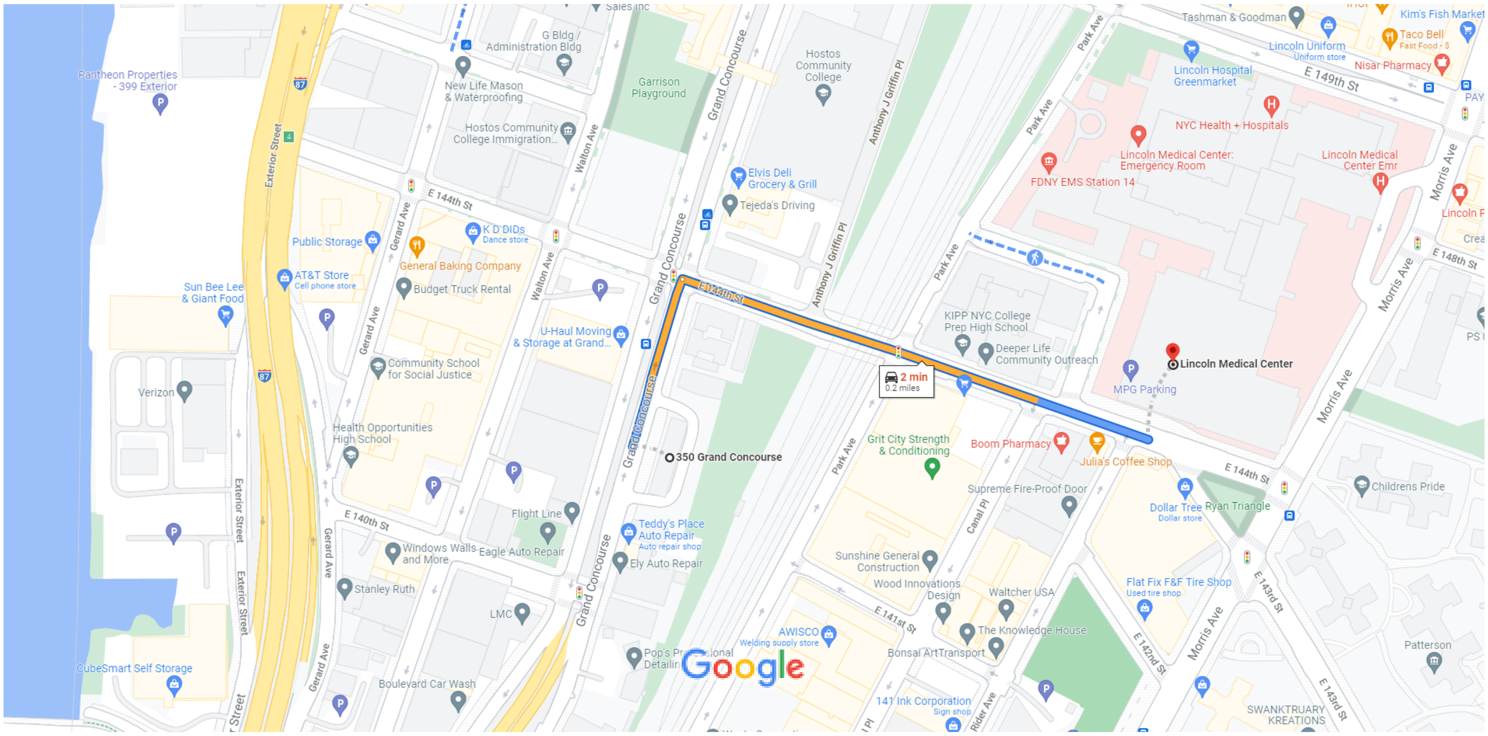
HOSPITAL ROUTE MAP

Google Maps

350 Grand Concourse, Bronx, NY 10451 to Lincoln Medical Center

Drive 0.2 mile, 2 min

Figure 2 - Hospital Route Map



Map data ©2021 Google 100 ft

350 Grand Concourse

Bronx, NY 10451

1. Head north on Grand Concourse toward E 144th St

335 ft

2. Turn right onto E 144th St

Destination will be on the left

0.2 mi

Lincoln Medical Center

234 E 149th St, Bronx, NY 10451

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

APPENDIX A

POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

Arsenic - ToxFAQs™

CAS # 7440-38-2

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.
- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Health and Human Services. Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

BARIUM
CAS # 7440-39-3

Division of Toxicology and Human Health Sciences ToxFAQs™ **June 2013**

This fact sheet answers the most frequently asked health questions (FAQs) about barium and barium compounds. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to barium occurs mostly in the workplace or from drinking contaminated water. Ingesting drinking water containing levels of barium above the EPA drinking water guidelines for relatively short periods of time can cause gastrointestinal disturbances and muscle weakness. Ingesting high levels for a long time can damage the kidneys. Barium and barium compounds have been found in at least 798 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is barium?

Barium is a silvery-white metal which exists in nature only in ores containing mixtures of elements. It combines with other chemicals such as sulfur or carbon and oxygen to form barium compounds.

Barium compounds are used by the oil and gas industries to make drilling muds. Drilling muds make it easier to drill through rock by keeping the drill bit lubricated. They are also used to make paint, bricks, ceramics, glass, and rubber.

Barium sulfate is sometimes used by doctors to perform medical tests and to take x-rays of the gastrointestinal tract.

What happens to barium when it enters the environment?

- Barium gets into the air during the mining, refining, and production of barium compounds, and from the burning of coal and oil.
- The length of time that barium will last in air, land, water, or sediments depends on the form of barium released.
- Barium compounds, such as barium sulfate and barium carbonate, which do not dissolve well in water, can last a long time in the environment.
- Barium compounds, such as barium chloride, barium nitrate, or barium hydroxide, that dissolve easily in water usually do not last in these forms for a long time in the environment. The barium in these compounds that is dissolved in water quickly combines with sulfate or carbonate that are naturally found in water and become the longer lasting forms (barium sulfate and barium carbonate).
- Fish and aquatic organisms can accumulate barium.

How might I be exposed to barium?

- Ingesting small amounts present in your food and water or breathing air containing very low levels of barium.
- Living in areas with unusually high natural levels of barium in the drinking water.
- Working in a job that involves barium production or use.
- Living or working near waste sites where barium has been disposed of.

How can barium affect my health?

The health effects of the different barium compounds depend on how well the compound dissolves in water or in the stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are not generally harmful.

Barium has been found to potentially cause gastrointestinal disturbances and muscular weakness when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time. Some people who eat or drink amounts of barium above background levels found in food and water for a short period may experience vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness. Eating or drinking very large amounts of barium compounds that easily dissolve can cause changes in heart rhythm or paralysis and possibly death. Animals that drank barium over long periods had damage to the kidneys, decreases in body weight, and some died.

How likely is barium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified barium as to its carcinogenicity. The EPA has determined that barium is not likely to be carcinogenic to humans following ingestion and that there is insufficient information to determine whether it will be carcinogenic to humans following inhalation exposure.

How can barium affect children?

We do not know whether children will be more or less sensitive than adults to barium toxicity. A study in rats that swallowed barium found a decrease in newborn body weight; we do not know if a similar effect would be seen in humans.

How can families reduce the risk of exposure to barium?

- ☐ The greatest potential source of barium exposure is through food and drinking water. However, the amount of barium in foods and drinking water are typically too low to be of concern.

Is there a medical test to determine whether I've been exposed to barium?

There is no routine medical test to determine whether you have been exposed to barium. Doctors can measure barium in body tissues and fluids, such as bones, blood, urine, and feces, using very complex instruments. These tests cannot be used to predict the extent of the exposure or potential health effects.

The geometric mean barium level measured in the U.S. general population aged 6 and older is reported by the Centers for Disease Control and Prevention (CDC) as 1.56 µg/g creatinine (measured in urine).

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2.0 milligrams of barium per liter of drinking water (2.0 mg/L), which is the same as 2 ppm.

The Occupational Safety and Health Administration (OSHA) has set Permissible Exposure Limits (PELs) of 0.5 milligrams of soluble barium compounds per cubic meter of workplace air (0.5 mg/m^3) for 8 hour shifts and 40 hour work weeks. The OSHA limits for barium sulfate dust are 15 mg/m^3 of total dust and 5 mg/m^3 for respirable fraction.

The National Institute for Occupational Safety and Health (NIOSH) has set Recommended Exposure Limits (RELs) of 0.5 mg/m^3 for soluble barium compounds. The NIOSH has set RELs of 10 mg/m^3 (total dust) for barium sulfate and 5 mg/m^3 (respirable fraction).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Barium and Compounds (*Update*). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

http://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Sep2012.pdf

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 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. 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.

Cadmium- ToxFAQs™

CAS # 7440-43-9

This fact sheet answers the most frequently asked health questions (FAQs) about cadmium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the kidneys, lungs, and bones. Cadmium has been found in at least 1,014 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is cadmium?

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide).

All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- Cadmium enters soil, water, and air from mining, industry, and burning coal and household wastes.
- Cadmium does not break down in the environment, but can change forms.
- Cadmium particles in air can travel long distances before falling to the ground or water.
- Some forms of cadmium dissolve in water.
- Cadmium binds strongly to soil particles.
- Fish, plants, and animals take up cadmium from the environment.

How might I be exposed to cadmium?

- Eating foods containing cadmium; low levels are found in all foods (highest levels are found in leafy vegetables, grains, legumes, and kidney meat).
- Smoking cigarettes or breathing cigarette smoke.
- Breathing contaminated workplace air.
- Drinking contaminated water.
- Living near industrial facilities which release cadmium into the air.

How can cadmium affect my health?

Breathing high levels of cadmium can severely damage the lungs. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea.

Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have determined that cadmium and cadmium compounds are human carcinogens. The EPA determined that cadmium is a probable human carcinogen (group B1).

CS265956-A

Cadmium

CAS # 7440-43-9

How can cadmium affect children?

The health effects in children are expected to be similar to the effects seen in adults (kidney and lung damage depending on the route of exposure).

A few studies in animals indicate that younger animals absorb more cadmium than adults. Animal studies also indicate that the young are more susceptible than adults to a loss of bone and decreased bone strength from exposure to cadmium.

We don't know if cadmium causes birth defects in people. Studies in animals exposed to high levels of cadmium during pregnancy have resulted in harmful effects to the young. Young animals exposed to cadmium before birth have shown effects on behavior and learning. There is also some information from animal studies that high enough exposures to cadmium before birth can reduce body weights and affect the skeleton in the developing young.

How can families reduce the risk of exposure to cadmium?

- Do not allow children to play with batteries. Dispose of nickel-cadmium batteries properly.
- Cadmium is a component of tobacco smoke. Avoid smoking and smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- If you work with cadmium, use all safety precautions to avoid carrying cadmium-containing dust home from work on your clothing, skin, hair, or tools.
- A balanced diet can reduce the amount of cadmium taken into the body from food and drink.

Is there a medical test to determine whether I've been exposed to cadmium?

Cadmium can be measured in blood, urine, hair, or nails. Urinary cadmium has been shown to accurately reflect the amount of cadmium in the body.

The amount of cadmium in your blood shows your recent exposure to cadmium. The amount of cadmium in your urine shows both your recent and your past exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to cadmium in drinking water at concentrations of 0.04 milligrams per liter (0.04 mg/L) for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 0.005 mg/L cadmium is not expected to cause any adverse effects.

The Food and Drug Administration (FDA) has determined that the cadmium concentration in bottled drinking water should not exceed 0.005 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 5 $\mu g/m^3$ for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Cadmium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

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COPPER

CAS # 7440-50-8

Division of Toxicology ToxFAQs™ **September 2004**

This fact sheet answers the most frequently asked health questions (FAQs) about copper. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Copper is a metal that occurs naturally in the environment, and also in plants and animals. Low levels of copper are essential for maintaining good health. High levels can cause harmful effects such as irritation of the nose, mouth and eyes, vomiting, diarrhea, stomach cramps, nausea, and even death. Copper has been found in at least 906 of the 1,647 National Priority Sites identified by the Environmental Protection Agency (EPA).

What is copper?

Copper is a metal that occurs naturally throughout the environment, in rocks, soil, water, and air. Copper is an essential element in plants and animals (including humans), which means it is necessary for us to live. Therefore, plants and animals must absorb some copper from eating, drinking, and breathing.

Copper is used to make many different kinds of products like wire, plumbing pipes, and sheet metal. U.S. pennies made before 1982 are made of copper, while those made after 1982 are only coated with copper. Copper is also combined with other metals to make brass and bronze pipes and faucets.

Copper compounds are commonly used in agriculture to treat plant diseases like mildew, for water treatment and, as preservatives for wood, leather, and fabrics.

What happens to copper when it enters the environment?

❏ Copper is released into the environment by mining, farming, and manufacturing operations and through waste water releases into rivers and lakes. Copper is also released from natural sources, like volcanoes, windblown dusts, decaying vegetation, and forest fires.
❏ Copper released into the environment usually attaches to particles made of organic matter, clay, soil, or sand.
❏ Copper does not break down in the environment. Copper compounds can break down and release free copper into the air, water, and foods.

How might I be exposed to copper?

❏ You may be exposed to copper from breathing air, drinking water, eating foods, or having skin contact with copper, particulates attached to copper, or copper-containing compounds.
❏ Drinking water may have high levels of copper if your house has copper pipes and acidic water.
❏ Lakes and rivers that have been treated with copper compounds to control algae, or that receive cooling water from power plants, can have high levels of copper. Soils can also contain high levels of copper, especially if they are near copper smelting plants.
❏ You may be exposed to copper by ingesting copper-containing fungicides, or if you live near a copper mine or where copper is processed into bronze or brass.
❏ You may be exposed to copper if you work in copper mines or if you grind metals containing copper.

How can copper affect my health?

Everyone must absorb small amounts of copper every day because copper is essential for good health. High levels of copper can be harmful. Breathing high levels of copper can cause irritation of your nose and throat. Ingesting high levels of copper can cause nausea, vomiting, and diarrhea. Very-high doses of copper can cause damage to your liver and kidneys, and can even cause death.

COPPER

CAS # 7440-50-8

How likely is copper to cause cancer?

We do not know whether copper can cause cancer in humans. The EPA has determined that copper is not classifiable as to human carcinogenicity.

How can copper affect children?

Exposure to high levels of copper will result in the same type of effects in children and adults. We do not know if these effects would occur at the same dose level in children and adults. Studies in animals suggest that the young children may have more severe effects than adults, but we don't know if this would also be true in humans. There is a very small percentage of infants and children who are unusually sensitive to copper.

We do not know if copper can cause birth defects or other developmental effects in humans. Studies in animals suggest that high levels of copper may cause a decrease in fetal growth.

How can families reduce the risk of exposure to copper?

The most likely place to be exposed to copper is through drinking water, especially if your water is corrosive and you have copper pipes in your house. The best way to lower the level of copper in your drinking water is to let the water run for at least 15 seconds first thing in the morning before drinking or using it. This reduces the levels of copper in tap water dramatically.

If you work with copper, wear the necessary protective clothing and equipment, and always follow safety procedures. Shower and change your clothes before going home each day.

Is there a medical test to show whether I've been exposed to copper?

Copper is found throughout the body; in hair, nails, blood, urine, and other tissues. High levels of copper in these samples can show that you have been exposed to higher-than normal levels of copper. These tests cannot tell whether you will experience harmful effects. Tests to measure copper levels in the body are not usually available at a doctor's office because they require special equipment, but the doctor can send samples to a specialty laboratory.

Has the federal government made recommendations to protect human health?

The EPA requires that levels of copper in drinking water be less than 1.3 mg of copper per one liter of drinking water (1.3 mg/L).

The U.S. Department of Agriculture has set the recommended daily allowance for copper at 900 micrograms of copper per day (µg/day) for people older than eight years old.

The Occupational Safety and Health Administration (OSHA) requires that levels of copper in the air in workplaces not exceed 0.1 mg of copper fumes per cubic meter of air (0.1 mg/m^3) and 1.0 mg/m^3 for copper dusts.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2004. Toxicological Profile for Copper. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Chromium - ToxFAQs™

CAS # 7440-47-3

This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and cause cancer. Ingesting high levels of chromium(VI) may result in anemia or damage to the stomach or intestines. Chromium(III) is an essential nutrient. Chromium has been found in at least 1,127 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- Chromium can be found in air, soil, and water after release from the manufacture, use, and disposal of chromium-based products, and during the manufacturing process.
- Chromium does not usually remain in the atmosphere, but is deposited into the soil and water.
- Chromium can easily change from one form to another in water and soil, depending on the conditions present.
- Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- Eating food containing chromium(III).
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Drinking contaminated well water.
- Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems, such as asthma, cough, shortness of breath, or wheezing. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III).

The main health problems seen in animals following ingestion of chromium(VI) compounds are irritation and ulcers in the stomach and small intestine and anemia. Chromium(III) compounds are much less toxic and do not appear to cause these problems.

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive tochromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

Chromium

CAS # 7440-47-3

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that chromium(VI) compounds are known human carcinogens.

In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Chromium(VI) also causes lung cancer in animals. An increase in stomach tumors was observed in humans and animals exposed to chromium(VI) in drinking water.

How can chromium affect children?

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Some developmental effects have been observed in animals exposed to chromium(VI).

How can families reduce the risk of exposure to chromium?

- Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.
- Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to determine whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. Chromium can be measured in hair, urine, and blood.

Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The EPA has established a maximum contaminant level of 0.1 mg/L for total chromium in drinking water.

The FDA has determined that the chromium concentration in bottled drinking water should not exceed 0.1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.005 mg/m^3 chromium(VI), 0.5 mg/m^3 chromium(III), and 1.0 mg/m^3 chromium(0) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

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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.

DDT, DDE, and DDD - ToxFAQs™

CAS # 50-29-3, 72-55-9, 72-54-8

This fact sheet answers the most frequently asked health questions (FAQs) about DDT, DDE, and DDD. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to DDT, DDE, and DDD occurs mostly from eating foods containing small amounts of these compounds, particularly meat, fish and poultry. High levels of DDT can affect the nervous system causing excitability, tremors and seizures. In women, DDE can cause a reduction in the duration of lactation and an increased chance of having a premature baby. DDT, DDE, and DDD have been found in at least 442 of the 1,613 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What are DDT, DDE, and DDD?

DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDT is a white, crystalline solid with no odor or taste. Its use in the U.S. was banned in 1972 because of damage to wildlife, but is still used in some countries.

DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT that contaminate commercial DDT preparations. DDE has no commercial use. DDD was also used to kill pests, but its use has also been banned. One form of DDD has been used medically to treat cancer of the adrenal gland.

What happens to DDT, DDE, and DDD when they enter the environment?

- DDT entered the environment when it was used as a pesticide; it still enters the environment due to current use in other countries.
- DDE enters the environment as contaminant or breakdown product of DDT; DDD also enters the environment as a breakdown product of DDT.
- DDT, DDE, and DDD in air are rapidly broken down by sunlight. Half of what's in air breaks down within 2 days.
- They stick strongly to soil; most DDT in soil is broken down slowly to DDE and DDD by microorganisms; half the DDT in soil will break down in 2–15 years, depending on the type of soil.
- Only a small amount will go through the soil into groundwater; they do not dissolve easily in water.
- DDT, and especially DDE, build up in plants and in fatty tissues of fish, birds, and other animals.

How might I be exposed to DDT, DDE, and DDD?

- Eating contaminated foods, such as root and leafy vegetables, fatty meat, fish, and poultry, but levels are very low.
- Eating contaminated imported foods from countries that still allow the use of DDT to control pests.
- Breathing contaminated air or drinking contaminated water near waste sites and landfills that may contain higher levels of these chemicals.
- Infants fed on breast milk from mothers who have been exposed.
- Breathing or swallowing soil particles near waste sites or landfills that contain these chemicals.

How can DDT, DDE, and DDD affect my health?

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months. A study in humans showed that women who had high amounts of a form of DDE in their breast milk were unable to breast feed their babies for as long as women who had little DDE in the breast milk. Another study in humans showed that women who had high amounts of DDE in the blood had an increased chance of having premature babies. In animals, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the liver. Also in animals, short-term oral exposure to small amounts of DDT or its breakdown products may also have harmful effects on reproduction.

DDT, DDE, and DDD - ToxFAQs™

CAS # 50-29-3, 72-55-9, 72-54-8

How likely are DDT, DDE, and DDD to cause cancer?

Studies in DDT-exposed workers did not show increases in cancer. Studies in animals given DDT with the food have shown that DDT can cause liver cancer.

The Department of Health and Human Services (DHHS) determined that DDT may reasonable be anticipated to be a human carcinogen.

The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans. The EPA determined that DDT, DDE, and DDD are probable human carcinogens.

How can DDT, DDE, and DDD affect children?

There are no studies on the health effects of children exposed to DDT, DDE, or DDD. We can assume that children exposed to large amounts of DDT will have health effects similar to the effects seen in adults. However, we do not know whether children differ from adults in their susceptibility to these substances.

There is no evidence that DDT, DDE, or DDD cause birth defects in people. A study showed that teenage boys whose mothers had higher DDE amounts in the blood when they were pregnant were taller than those whose mothers had lower DDE levels. However, a different study found the opposite in preteen girls. The reason for the discrepancy between these studies is unknown.

Studies in rats have shown that DDT and DDE can mimic the action of natural hormones and in this way affect the development of the reproductive and nervous systems. Puberty was delayed in male rats given high amounts of DDE as juveniles. This could possibly happen in humans.

A study in mice showed that exposure to DDT during the first weeks of life may cause neurobehavioral problems later in life.

How can families reduce the risk of exposure to DDT,DDE, and DDE?

- Most families will be exposed to DDT by eating food or drinking liquids contaminated with small amounts of DDT.
- Cooking will reduce the amount of DDT in fish.
- Washing fruit and vegetables will remove most DDT from their surface.
- Follow health advisories that tell you about consumption of fish and wildlife caught in contaminated areas.

Is there a medical test to show whether I've been exposed to DDT, DDE, and DDD?

Laboratory tests can detect DDT, DDE, and DDD in fat, blood, urine, semen, and breast milk. These tests may show low, moderate, or excessive exposure to these compounds, but cannot tell the exact amount you were exposed to, or whether you will experience adverse effects. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) sets a limit of 1 milligram of DDT per cubic meter of air (1 mg/m^3) in the workplace for an 8-hour shift, 40-hour workweek.

The Food and Drug Administration (FDA) has set limits for DDT, DDE, and DDD in foodstuff at or above which the agency will take legal action to remove the products from the market.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for DDT/DDE/DDD (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology 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.

Aldrin and Dieldrin- ToxFAQs™

CAS # 309-00-2 and 60-57-1

This fact sheet answers the most frequently asked health questions (FAQs) about aldrin and dieldrin. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to aldrin and dieldrin happens mostly from eating contaminated foods, such as root crops, fish, or seafood. Aldrin and dieldrin build up in the body after years of exposure and can affect the nervous system. Aldrin has been found in at least 207 of the 1,613 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA). Dieldrin has been found in at least 287 of the 1,613 sites.

What are aldrin and dieldrin?

Aldrin and dieldrin are insecticides with similar chemical structures. They are discussed together in this fact sheet because aldrin quickly breaks down to dieldrin in the body and in the environment. Pure aldrin and dieldrin are white powders with a mild chemical odor. The less pure commercial powders have a tan color. Neither substance occurs naturally in the environment.

From the 1950s until 1970, aldrin and dieldrin were widely used pesticides for crops like corn and cotton. Because of concerns about damage to the environment and potentially to human health, EPA banned all uses of aldrin and dieldrin in 1974, except to control termites. In 1987, EPA banned all uses.

What happens to aldrin and dieldrin when they enter the environment?

- Sunlight and bacteria change aldrin to dieldrin so that we mostly find dieldrin in the environment.
- They bind tightly to soil and slowly evaporate to the air.
- Dieldrin in soil and water breaks down very slowly.
- Plants take in and store aldrin and dieldrin from the soil.
- Aldrin rapidly changes to dieldrin in plants and animals.
- Dieldrin is stored in the fat and leaves the body very slowly.

How might I be exposed to aldrin or dieldrin?

- Dieldrin is everywhere in the environment, but at very low levels.
- Eating food like fish or shellfish from lakes or streams contaminated with either chemical, or contaminated root crops, dairy products, or meats.
- Air, surface water, or soil near waste sites may contain higher levels.
- Living in homes that were once treated with aldrin or dieldrin to control termites.

How can aldrin and dieldrin affect my health?

People who have intentionally or accidentally ingested large amounts of aldrin or dieldrin have suffered convulsions and some died. Health effects may also occur after a longer period of exposure to smaller amounts because these chemicals build up in the body.

Some workers exposed to moderate levels in the air for a long time had headaches, dizziness, irritability, vomiting, and uncontrolled muscle movements. Workers removed from the source of exposure rapidly recovered from most of these effects.

Animals exposed to high amounts of aldrin or dieldrin also had nervous system effects. In animals, oral exposure to lower levels for a long period also affected the liver and decreased their ability to fight infections. We do not know whether aldrin or dieldrin affect the ability of people to fight disease.

Studies in animals have given conflicting results about whether aldrin and dieldrin affect reproduction in male animals and whether these chemicals may damage the sperm. We do not know whether aldrin or dieldrin affect reproduction in humans.

Aldrin and Dieldrin

CAS # 309-00-2 and 60-57-1

How likely are aldrin and dieldrin to cause cancer?

There is no conclusive evidence that aldrin or dieldrin cause cancer in humans. Aldrin and dieldrin have shown to cause liver cancer in mice. The International Agency for Research on Cancer (IARC) has determined that aldrin and dieldrin are not classifiable as to human carcinogenicity. The EPA has determined that aldrin and dieldrin are probable human carcinogens.

How can aldrin and dieldrin affect children?

Children can be exposed to aldrin and dieldrin in the same way as adults. There are no known unique exposure pathways for children. Children who swallowed amounts of aldrin or dieldrin much larger than those found in the environment suffered convulsions and some died, as occurred in adults. However, we do not know whether children are more susceptible than adults to the effects of aldrin or dieldrin.

We do not know whether aldrin or dieldrin cause birth defects in humans. Pregnant animals that ingested aldrin or dieldrin had some babies with low birth weight and some with alterations in the skeleton. Dieldrin has been found in human breast milk, therefore, it can be passed to suckling infants.

How can families reduce their risk for exposure to aldrin and dieldrin?

- Since aldrin and dieldrin are no longer produced or used, exposure to these compounds will occur only from past usage.
- Because aldrin and dieldrin were applied to the basement of some homes for termite protection, before buying a home families should investigate what, if any, pesticides have been used within the home.

Is there a medical test to show whether I've been exposed to aldrin and dieldrin?

There are laboratory tests that can measure aldrin and dieldrin in your blood, urine, and body tissues. Because aldrin changes to dieldrin fairly quickly in the body, the test has to be done shortly after you are exposed to aldrin. Since dieldrin can stay in the body for months, measurements of dieldrin can be made much longer after exposure to either aldrin or dieldrin. The tests cannot tell you whether harmful health effects will occur. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The EPA limits the amount of aldrin and dieldrin that may be present in drinking water to 0.001 and 0.002 milligrams per liter (mg/L) of water, respectively, for protection against health effects other than cancer. The EPA has determined that a concentration of aldrin and dieldrin of 0.0002 mg/L in drinking water limits the lifetime risk of developing cancer from exposure to each compound to 1 in 10,000.

The Occupational Safety and Health Administration (OSHA) sets a maximum average of 0.25 milligrams of aldrin and dieldrin per cubic meter of air (0.25 mg/m^3) in the workplace during an 8-hour shift, 40 hour week. The National Institute for Occupational Safety and Health (NIOSH) also recommends a limit of 0.25 mg/m^3 for both compounds for up to a 10-hour work day, 40-hour week.

The Food and Drug Administration (FDA) regulates the residues of aldrin and dieldrin in raw foods. The allowable range is from 0 to 0.1 ppm, depending on the type of food product.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Aldrin/Dieldrin. 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.

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FUEL OILS

CAS # 8008-20-6, 70892-10-3, 68476-30-2, 68476-34-6, 68476-31-3

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about fuel oils. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are fuel oils?

(Pronounced fyo͞o′əl oilz)

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

What happens to fuel oils when they enter the environment?

- ❑ Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- ❑ Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.
- ❑ Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- ❑ Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- ❑ Some of the chemicals found in fuel oils may build up significantly in plants and animals.

How might I be exposed to fuel oils?

- ❑ Using a home kerosene heater or stove, or using fuel oils at work.
- ❑ Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- ❑ Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- ❑ Touching soil contaminated with fuel oils.
- ❑ Using fuel oils to wash paint or grease from skin or equipment.

How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, lightheadedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m^3) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Lead – ToxFAQs™

CAS # 7439-92-1

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.
- Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high-levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services (DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

Lead

CAS # 7439-92-1

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

- Avoid exposure to sources of lead.
- Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.
- If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children.
- If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC has updated its recommendations on children's blood lead levels. Experts now use an upper reference level value of 97.5% of the population distribution for children's blood lead. In 2012-2015, the value to identify children with blood lead levels that are much higher than most children have, is 5 micrograms per deciliter (µg/dL). EPA limits lead in drinking water to 15 µg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

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Manganese - ToxFAQs™

CAS # 7439-96-5

This fact sheet answers the most frequently asked health questions (FAQs) about manganese. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Manganese is a trace element and eating a small amount from food or water is needed to stay healthy. Exposure to excess levels of manganese may occur from breathing air, particularly where manganese is used in manufacturing, and from drinking water and eating food. At high levels, it can cause damage to the brain. Manganese has been found in at least 869 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is manganese?

Manganese is a naturally occurring metal that is found in many types of rocks. Pure manganese is silver-colored, but does not occur naturally. It combines with other substances such as oxygen, sulfur, or chlorine. Manganese occurs naturally in most foods and may be added to some foods.

Manganese is used principally in steel production to improve hardness, stiffness, and strength. It may also be used as an additive in gasoline to improve the octane rating of the gas.

What happens to manganese when it enters the environment?

- Manganese can be released to the air, soil, and water from the manufacture, use, and disposal of manganese-based products.
- Manganese cannot break down in the environment. It can only change its form or become attached to or separated from particles.
- In water, manganese tends to attach to particles in the water or settle into the sediment.
- The chemical state of manganese and the type of soil determine how fast it moves through the soil and how much is retained in the soil.
- The manganese-containing gasoline additive may degrade in the environment quickly when exposed to sunlight, releasing manganese.

How might I be exposed to manganese?

- The primary way you can be exposed to manganese is by eating food or manganese-containing nutritional supplements. Vegetarians, who consume foods rich in manganese such as grains, beans and nuts, as well as heavy tea drinkers, may have a higher intake of manganese than the average person.
- Certain occupations like welding or working in a factory where steel is made may increase your chances of being exposed to high levels of manganese.
- Manganese is routinely contained in groundwater, drinking water, and soil at low levels. Drinking water containing manganese or swimming or bathing in water containing manganese may expose you to low levels of this chemical.

How can manganese affect my health?

Manganese is an essential nutrient, and eating a small amount of it each day is important to stay healthy.

The most common health problems in workers exposed to high levels of manganese involve the nervous system. These health effects include behavioral changes and other nervous system effects, which include movements that may become slow and clumsy. This combination of symptoms when sufficiently severe is referred to as "manganism". Other less severe nervous system effects such as slowed hand movements have been observed in some workers exposed to lower concentrations in the work place.

Manganese

CAS # 7439-96-5

Exposure to high levels of manganese in air can cause lung irritation and reproductive effects.

Nervous system and reproductive effects have been observed in animals after high oral doses of manganese.

How likely is manganese to cause cancer?

The EPA concluded that existing scientific information cannot determine whether or not excess manganese can cause cancer.

How can manganese affect children?

Studies in children have suggested that extremely high levels of manganese exposure may produce undesirable effects on brain development, including changes in behavior and decreases in the ability to learn and remember. We do not know for certain that these changes were caused by manganese alone. We do not know if these changes are temporary or permanent. We do not know whether children are more sensitive than adults to the effects of manganese, but there is some indication from experiments in laboratory animals that they may be.

Studies of manganese workers have not found increases in birth defects or low birth weight in their offspring. No birth defects were observed in animals exposed to manganese.

How can families reduce the risk of exposure to manganese?

- Children are not likely to be exposed to harmful amounts of manganese in the diet. However, higher-than-usual amounts of manganese may be absorbed if their diet is low in iron. It is important to provide your child with a well-balanced diet.
- Workers exposed to high levels of airborne manganese in certain occupational settings may accumulate manganese dust on their work clothes. Manganese-contaminated work clothing should be removed before getting into your car or entering your home to help reduce the exposure hazard for yourself and your family.

Is there a medical test to determine whether I've been exposed to manganese?

Several tests are available to measure manganese in blood, urine, hair, or feces. Because manganese is normally present in our body, some is always found in tissues or fluids.

Because excess manganese is usually removed from the body within a few days, past exposures are difficult to measure with common laboratory tests.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to manganese in drinking water at concentrations of 1 mg/L for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has established that lifetime exposure to 0.3 mg/L manganese is not expected to cause any adverse effects.

The Food and Drug Administration (FDA) has determined that the manganese concentration in bottled drinking water should not exceed 0.05 mg/L.

The Occupational Health and Safety Administration (OSHA) has established a ceiling limit (concentration that should not be exceeded at any time during exposure) of 5 mg/m^3 for manganese in workplace air.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Manganese. Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and 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.

Mercury - ToxFAQs™

CAS # 7439-97-6

This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is mercury?

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, some dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.
- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- Eating fish or shellfish contaminated with methylmercury.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fossil fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

CS265956-A

Mercury

CAS # 7439-97-6

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there, possibly causing damage to the developing nervous system. It can also pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may affect the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to determine whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m^3) and 0.05 mg/m^3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

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ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

NICKEL

CAS # 7440-02-0

Division of Toxicology ToxFAQs™ **August 2005**

This fact sheet answers the most frequently asked health questions (FAQs) about nickel. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Nickel is a naturally occurring element. Pure nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds developed chronic bronchitis and lung and nasal sinus cancers. Nickel has been found in at least 882 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is nickel?

Nickel is a very abundant natural element. Pure nickel is a hard, silvery-white metal. Nickel can be combined with other metals, such as iron, copper, chromium, and zinc, to form alloys. These alloys are used to make coins, jewelry, and items such as valves and heat exchangers. Most nickel is used to make stainless steel.

Nickel can combine with other elements such as chlorine, sulfur, and oxygen to form nickel compounds. Many nickel compounds dissolve fairly easy in water and have a green color. Nickel compounds are used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. Nickel is found in all soil and is emitted from volcanoes. Nickel is also found in meteorites and on the ocean floor. Nickel and its compounds have no characteristic odor or taste.

What happens to nickel when it enters the environment?

❑ Nickel is released into the atmosphere by industries that make or use nickel, nickel alloys, or nickel compounds. It is also released into the atmosphere by oil-burning power plants, coal-burning power plants, and trash incinerators.

❑ In the air, it attaches to small particles of dust that settle to the ground or are taken out of the air in rain or snow; this usually takes many days.

❑ Nickel released in industrial waste water ends up in soil or sediment where it strongly attaches to particles containing iron or manganese.

❑ Nickel does not appear to accumulate in fish or in other animals used as food.

How might I be exposed to nickel?

❑ By eating food containing nickel, which is the major source of exposure for most people.

❑ By skin contact with soil, bath or shower water, or metals containing nickel, as well as by handling coins or touching jewelry containing nickel.

❑ By drinking water that contains small amounts of nickel.

❑ By breathing air or smoking tobacco containing nickel.

❑ Higher exposure may occur if you work in industries that process or use nickel.

How can nickel affect my health?

The most common harmful health effect of nickel in humans is an allergic reaction. Approximately 10-20% of the population is sensitive to nickel. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin for a long time. Once a person is sensitized to nickel, further contact with the metal may produce a reaction. The most common reaction is a skin rash at the site of contact. The skin rash may also occur at a site away from the site of contact. Less frequently, some people who are sensitive to nickel have asthma attacks following exposure to nickel. Some sensitized people react when they consume food or water containing nickel or breathe dust containing it.

People working in nickel refineries or nickel-processing plants have experienced chronic bronchitis and reduced lung function. These persons breathed amounts of nickel much higher than levels found normally in the environment. Workers who drank water containing high amounts of nickel had stomach ache and suffered adverse effects to their blood and kidneys.

Damage to the lung and nasal cavity has been observed in rats and mice breathing nickel compounds. Eating or drinking large amounts of nickel has caused lung disease in dogs and rats and has affected the stomach, blood, liver, kidneys, and immune system in rats and mice, as well as their reproduction and development.

How likely is nickel to cause cancer?

Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants. The Department of Health and Human Services (DHHS) has determined that nickel metal may reasonably be anticipated to be a carcinogen and that nickel compounds are known human carcinogens. The International Agency for Research on Cancer (IARC) has determined that some nickel compounds are carcinogenic to humans and that metallic nickel may possibly be carcinogenic to humans. The EPA has determined that nickel refinery dust and nickel subsulfide are human carcinogens.

How can nickel affect children?

It is likely that the health effects seen in children exposed to nickel will be similar to those seen in adults. We do not know whether children differ from adults in their susceptibility to nickel. Human studies that examined whether nickel can harm the fetus are inconclusive. Animal studies have found increases in newborn deaths and decreased newborn weight after ingesting very high amounts of nickel. Nickel can be transferred from the mother to an infant in breast milk and can cross the placenta.

How can families reduce the risks of exposure to nickel?

❏ Avoiding jewelry containing nickel will eliminate risks of exposure to this source of the metal.

❏ Exposures of the general population from other sources, such as foods and drinking water, are almost always too low to be of concern.

Is there a medical test to determine whether I've been exposed to nickel?

There are tests available to measure nickel in your blood, feces, and urine. More nickel was measured in the urine of workers who were exposed to nickel compounds that dissolve easily in water than in the urine of workers exposed to nickel compounds that are hard to dissolve. This means that it is easier to tell if you have been exposed to soluble nickel compounds than less-soluble compounds. The nickel measurements do not accurately predict potential health effects from exposure to nickel.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water should contain no more than 0.1 milligrams of nickel per liter of water (0.1 mg/L). To protect workers, the Occupational Safety and Health Administration (OSHA) has set a limit of 1 mg of nickel per cubic meter of air (1 mg/m^3) for metallic nickel and nickel compounds in workplace air during an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Nickel (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Polychlorinated Biphenyls - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. PCBs have been classified as probably carcinogenic, and carcinogenic to humans (group 1) by the Environmental Protection Agency (EPA) and International Agency for Research on Cancer (IARC), respectively.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risks of exposure to PCBs?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.
- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs^{TM} Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

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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.

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Tetrachloroethylene - ToxFAQs™

CAS # 127-18-4

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness headaches, sleepiness, incoordination confusion, nausea, unconsciousness, and even death. Tetrachloroethylene has been found in at least 945 of the 1,699 National Priorities List sites identified by U.S. Environmental Protection Agency (EPA).

What is tetrachloroethylene?

Tetrachloroethylene is a nonflammable colorless liquid. Other names for tetrachloroethylene include perchloroethylene, PCE, perc, tetrachloroethene, and perchlor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part in 1 million parts of air (1 ppm) or more.

Tetrachloroethylene is used as a dry cleaning agent and metal degreasing solvent. It is also used as a starting material (building block) for making other chemicals and is used in some consumer products.

What happens to tetrachloroethylene when it enters the environment?

- Tetrachloroethylene can be released into air, water, and soil at places where it is produced or used.
- Tetrachloroethylene breaks down very slowly in the air and so it can be transported long distances in the air. Half of the amount in the air will degrade in approximately 100 days.
- Tetrachloroethylene evaporates quickly from water into air. It is generally slow to break down in water.
- Tetrachloroethylene may evaporate quickly from shallow soils or may filter through the soil and into the groundwater below. It is generally slow to break down in soil.

How might I be exposed to tetrachloroethylene?

- When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- When you drink water containing tetrachloroethylene, you are exposed to it. You might also be exposed to tetrachloroethylene that is released into the air during showering and bathing.
- People residing near contaminated sites or dry cleaning locations may be exposed to higher levels than the general population.
- People working in the dry cleaning industries or using metal degreasing products may be exposed to elevated levels of tetrachloroethylene.

How can tetrachloroethylene affect my health?

Breathing high levels of tetrachloroethylene for a brief period may cause dizziness or drowsiness, headache, and incoordination; higher levels may cause unconsciousness and even death.

Exposure for longer periods to low levels of tetrachloroethylene may cause changes in mood, memory, attention, reaction time, and vision.

Studies in animals exposed to tetrachloroethylene have shown liver and kidney effects, and changes in brain chemistry, but we do not know what these findings mean for humans.

How likely is tetrachloroethylene to cause cancer?

Studies in humans suggest that exposure to tetrachloroethylene might lead to a higher risk of getting bladder cancer, multiple myeloma, or non-Hodgkin's lymphoma, but the evidence is not very strong.

In animals, tetrachloroethylene has been shown to cause cancers of the liver, kidney, and blood system.

EPA considers tetrachloroethylene likely to be carcinogenic to humans by all routes of exposure. The International Agency for Research on Cancer (IARC) considers tetrachloroethylene probably carcinogenic to humans. The Department of Health and Human Services (DHHS) considers tetrachloroethylene to be reasonable anticipated to be a human carcinogen.

How can tetrachloroethylene affect children?

It is not known whether children are more susceptible than adults to the effects of tetrachloroethylene.

A few studies in humans have suggested that exposure to tetrachloroethylene increased the numbers of babies with birth defects, but these studies were not large enough to clearly answer the question. Studies in animals exposed by inhalation or stomach tube have not shown clear evidence of specific birth defects.

How can families reduce the risks of exposure to tetrachloroethylene?

- Tetrachloroethylene has been found in low levels in some food. You can minimize the risk of your family's exposure by peeling and thoroughly washing fruits and vegetables before cooking.
- Use bottled water if you have concerns about the presence of tetrachloroethylene in your tap water. You may also contact local drinking water authorities and follow their advice.
- Prevent children from playing in dirt or eating dirt if you live near a waste site that has tetrachloroethylene.
- Tetrachloroethylene is widely used as a scouring solvent that removes oils from fabrics, as a carrier solvent, as a fabric finish or water repellant, and as a metal degreaser/cleaner. Follow instructions on product labels to minimize exposure to tetrachloroethylene.

Is there a medical test to show whether I've been exposed to tetrachloroethylene?

Tetrachloroethylene and its breakdown products (metabolites) can be measured in blood and urine. However, the detection of tetrachloroethylene or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because tetrachloroethylene and its metabolites leave the body fairly rapidly, the tests need to be conducted within days after exposure.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set an 8-hour time weighted average permissible exposure limit of 100 ppm, an acceptable ceiling exposure limit of 200 ppm, and a maximum peak of 300 ppm (not to be exceeded for more than 5 minutes of any 3-hour period).

The National Institute for Occupational Safety and Health (NIOSH) recommends that workplace exposure to tetrachloroethylene be minimized due to concerns about its carcinogenicity.

References

This ToxFAQs™ information is taken from the 2014 Toxicological Profile for Tetrachloroethylene (Draft for Public Comment) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services in Atlanta, GA

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, FAX: 770-488-4178.

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.

Trichloroethylene - ToxFAQs™

CAS # 79-01-6

This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Trichloroethylene is used as a solvent for cleaning metal parts. Exposure to very high concentrations of trichloroethylene can cause dizziness, headaches, sleepiness, incoordination, confusion, nausea, unconsciousness, and even death. The Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC) classify trichloroethylene as a human carcinogen. Trichloroethylene has been found in at least 1,045 of the 1,699 National Priorities List sites identified by the EPA.

What is trichloroethylene?

Trichloroethylene is a colorless, volatile liquid. Liquid trichloroethylene evaporates quickly into the air. It is nonflammable and has a sweet odor.

The two major uses of trichloroethylene are as a solvent to remove grease from metal parts and as a chemical that is used to make other chemicals, especially the refrigerant, HFC-134a. Trichloroethylene was once used as an anesthetic for surgery.

What happens to trichloroethylene when it enters the environment?

- Trichloroethylene can be released to air, water, and soil at places where it is produced or used.
- Trichloroethylene is broken down quickly in air.
- Trichloroethylene breaks down very slowly in soil and water and is removed mostly through evaporation to air.
- It is expected to remain in groundwater for long time since it is not able to evaporate.
- Trichloroethylene does not build up significantly in plants or animals.

How might I be exposed to trichloroethylene?

- Breathing trichloroethylene in contaminated air.
- Drinking contaminated water.
- Workers at facilities using this substance for metal degreasing are exposed to higher levels of trichloroethylene.
- If you live near such a facility or near a hazardous waste site containing trichloroethylene, you may also have higher exposure to this substance.

How can trichloroethylene affect my health?

Exposure to moderate amounts of trichloroethylene may cause headaches, dizziness, and sleepiness; large amounts may cause coma and even death. Eating or breathing high levels of trichloroethylene may damage some of the nerves in the face. Exposure to high levels can also result in changes in the rhythm of the heartbeat, liver damage, and evidence of kidney damage. Skin contact with concentrated solutions of trichloroethylene can cause skin rashes.

There is some evidence exposure to trichloroethylene in the work place may cause scleroderma (a systemic autoimmune disease) in some people. Some men occupationally-exposed to trichloroethylene and other chemicals showed decreases in sex drive, sperm quality, and reproductive hormone levels.

How likely is trichloroethylene to cause cancer?

There is strong evidence that trichloroethylene can cause kidney cancer in people and some evidence for trichloroethylene-induced liver cancer and malignant lymphoma. Lifetime exposure to trichloroethylene resulted in increased liver cancer in mice and increased kidney cancer and testicular cancer in rats.

The National Toxicology Program (NTP) has determined that trichloroethylene is a "known human carcinogen". The EPA and the International Agency for Research on Cancer (IARC) have determined that trichloroethylene is "carcinogenic to humans."

Trichloroethylene

CAS # 79-01-6

How can trichloroethylene affect children?

It is not known whether children are more susceptible than adults to the effects of trichloroethylene.

Some human studies indicate that trichloroethylene may cause developmental effects such as spontaneous abortion, congenital heart defects, central nervous system defects, and small birth weight. However, these people were exposed to other chemicals as well.

In some animal studies, exposure to trichloroethylene during development caused decreases in body weight, increases in heart defects, changes to the developing nervous system, and effects on the immune system.

How can families reduce the risk of exposure to trichloroethylene?

- Avoid drinking water from sources that are known to be contaminated with trichloroethylene. Use bottled water if you have concerns about the presence of chemicals in your tap water. You may also contact local drinking water authorities and follow their advice.
- Discourage your children from putting objects in their mouths. Make sure that they wash their hands frequently and before eating.
- Prevent children from playing in dirt or eating dirt if you live near a waste site that has trichloroethylene.
- Trichloroethylene is used in many industrial products. Follow instructions on product labels to minimize exposure to trichloroethylene.

Is there a medical test to show whether I've been exposed to trichloroethylene?

Trichloroethylene and its breakdown products (metabolites) can be measured in blood and urine. However, the detection of trichloroethylene or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because trichloroethylene and its metabolites leave the body fairly rapidly, the tests need to be conducted within days after exposure.

Has the federal government made recommendations to protect human health?

The EPA set a maximum contaminant goal (MCL) of 0.005 milligrams per liter (mg/L; 5 ppb) as a national primary drinking standard for trichloroethylene.

The Occupational Safety and Health Administration (OSHA) set a permissible exposure limit (PEL) of 100 ppm for trichloroethylene in air averaged over an 8-hour work day, an acceptable ceiling concentration of 200 ppm provided the 8 hour PEL is not exceeded, and an acceptable maximum peak of 300 ppm for a maximum duration of 5 minutes in any 2 hours.

The National Institute for Occupational Safety and Health (NIOSH) considers trichloroethylene to be a potential occupational carcinogen and established a recommended exposure limit (REL) of 2 ppm (as a 60-minute ceiling) during its use as an anesthetic agent and 25 ppm (as a 10-hour TWA) during all other exposures.

References

This ToxFAQs™ information is taken from the 2014 Toxicological Profile for Trichloroethylene (Draft for Public Comment) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services.

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™ Ion the web: www.atsdr.cdc.gov/toxFAQs.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

APPENDIX B

WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

The following section is based upon information provided by the CDC Division of Vector-Borne Infectious Diseases. Symptoms of West Nile Virus include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands, with most infections being mild. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death. Most infections of St. Louis encephalitis are mild without apparent symptoms other than fever with headache. More severe infection is marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions (especially infants) and spastic (but rarely flaccid) paralysis. The only way to avoid infection of West Nile Virus and St. Louis encephalitis is to avoid mosquito bites. To reduce the chance of mosquito contact:

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET (N, N-diethyl-meta-toluamide), since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET. DEET in high concentrations (greater than 35%) provides no additional protection.
- Repellents may irritate the eyes and mouth.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's directions for use, as printed on the product.

APPENDIX C
REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: ________________ Project Name/Number: ________________

Report Date: ________________ Project Manager Name: ________________

Summary of any violations of procedures occurring that week:

Summary of any job related injuries, illnesses, or near misses that week:

Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

Comments:

Name: ________________ Company: ________________

Signature: ________________ Title: ________________

INCIDENT REPORT FORM

Date of Report: ____________________

Injured: ____________________

Employer: ____________________

Site: ____________________ Site Location: ____________________

Report Prepared By: ____________________ ____________________
Signature Title

ACCIDENT/INCIDENT CATEGORY (check all that applies)

___Injury
__ Property Damage
__ On-site Equipment
__ Mechanical
___ Illness
___ Fire
___ Motor Vehicle
___ Spill
___ Near Miss
___ Chemical Exposure
___ Electrical
___ Other

DATE AND TIME OF ACCIDENT/INCIDENT: Narrative report of Accident/Incident: Identify: 1) actions leading to or contributing to the accident/incident; 2) the accident/incident occurrence; and 3) actions following the accident/incident.

WITNESS TO ACCIDENT/INCIDENT:

Name: ____________________ Company: ____________________
Address: ____________________ Address: ____________________
Phone No.: ____________________ Phone No.: ____________________
Name: ____________________ Company: ____________________
Address: ____________________ Address: ____________________
Phone No.: ____________________ Phone No.: ____________________

INJURED - ILL:

Name: ____________________ SSN: ____

Address: ____________________ Age: ____

Length of Service: ____________________ Time on Present Job: ____________________________

Time/Classification: ____

SEVERITY OF INJURY OR ILLNESS:

____ Disabling ___ Non-disabling ___ Fatality

____ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: ______________________________

NATURE OF INJURY OR ILLNESS: ____

____

____

____

CLASSIFICATION OF INJURY:

__ Abrasions

__ Bites

__ Blisters

__ Bruises

__ Chemical Burns

__ Cold Exposure

__ Concussion

__ Lacerations

_____ Dislocations

_____ Faint/Dizziness

_____ Fractures

_____ Frostbite

_____ Heat Burns

_____ Heat Exhaustion

_____ Heat Stroke

____ Punctures

____ Radiation Burns

____ Respiratory Allergy

____ Sprains

____ Toxic Resp. Exposure

____ Toxic Ingestion

____ Dermal Allergy

Part of Body Affected: ____

Degree of Disability: ____

Date Medical Care was Received: ____

Where Medical Care was Received: ____

Address (if off-site): ____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE:

Description of Damage: ______________________________

____

Cost of Damage: $ ______________________________

ACCIDENT/INCIDENT LOCATION: ______________________________

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident (Object, substance, material, machinery, equipment, conditions)

____

____

____

____

Was weather a factor?:______________________________

____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

____

____

____

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

____

____

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

____

____

Modifications:

____

Was injured using required equipment?:

____

____

If not, how did actual equipment use differ from plan?:

____

____

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed	SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature	Title
Signature	Title
Signature	Title

ACCIDENT/INCIDENT FOLLOW-UP: Date:

Outcome of accident/incident:

Physician's recommendations:

Date injured returned to work:

Follow-up performed by:

Signature	Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

APPENDIX D

EMERGENCY HAND SIGNALS

EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATHE!

Hand gripping throat

LEAVE AREA IMMEDIATELY, NO DEBATE!

(No Picture) Grip partner's wrist or place both hands around waist

NEED ASSISTANCE!

Hands on top of head

OKAY! – I'M ALL RIGHT!

- I UNDERSTAND!

Thumbs up

NO! - NEGATIVE!

Thumbs down