MAPES EAST 182 STREET

BRONX, NEW YORK

Draft Remedial Investigation Work Plan

NYSDEC BCP Site No.: C203149
AKRF Project Number: 210138

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 Work Plan (RIWP) has been prepared by AKRF, Inc. (AKRF) on behalf of East 182 Street Associates, LLC (the Applicant), for the property located at 820 East 182nd Street in the Belmont section of the Bronx, New York, hereafter referred to as the “Site.” The Site is identified by the City of New York as Borough of the Bronx, Tax Block 3111, Lot 59.

Currently, the Site is developed with a former Sunoco® gasoline station and a single-story building that formerly housed an auto repair shop and adjoining convenience store. A decommissioned pump island, located in the eastern portion of the lot, was supplied by five 4,000-gallon gasoline underground storage tanks (USTs) located beneath the northern portion of the Site. In addition, an empty 1,000-gallon waste oil UST is located in the northwestern portion of the Site, abutting the auto repair shop. The pump island was disconnected in May 2021 and the USTs were emptied and taken out-of-service in October 2021. The exterior surface of the Site is asphalt-paved with surficial cracking and petroleum-like staining noted throughout, including around the pump island.

The Site is abutted to the north by East 182nd Street, followed by a multi-story apartment building; to the south by multi-story apartment buildings; to the east by the intersection of Southern Boulevard, East 182nd Street, and Crotona Parkway, followed by the Bronx Zoo; and to the west by a multi-tenant commercial building consisting of a deli/grocery, restaurant, and beauty spa. The surrounding area comprises predominantly residential and commercial uses. A Site Location Map is provided as Figure 1, and a Site Plan is provided as Figure 2.

The Applicant was accepted into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) on November 2, 2021 as a Volunteer (BCP Site No. C203149). A Phase II Environmental Site Assessment (ESA) was conducted by AKRF in March 2021, and documented in a Phase II ESA Report dated May 2021. The previous investigation identified elevated levels of petroleum-related volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and select metals in soil, and petroleum-related VOCs in soil vapor. Groundwater was not encountered above presumed bedrock.

This RIWP describes the procedures to be used to define the nature and extent of contamination at the Site. The data compiled from the Remedial Investigation (RI), as described in this RIWP, 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) and Community Air Monitoring Plan (CAMP) (Appendix B). The CAMP will be implemented during all subsurface investigation activities involving soil disturbance at the Site.

Contact information for the parties responsible for the work described in this RIWP are included in Table 1:

Table 1
Remedial Investigation Personnel Contact Information

Company	Individual Name	Title	Contact Number
NYSDEC	Rafi Alam	Project Manager	(518) 402-8606
NYSDOH	Johnathan Robinson	Project Manager	(518) 402-0445
AKRF	Deborah Shapiro	Project Director, QEP	(646) 388-9544
	Adrianna Bosco	Project Manager	(646) 388-9576
	Tim Larigan	Field Team Leader/Site Safety Officer (SSO)	(862) 368-8791 (cell)

Table 1
Remedial Investigation Personnel Contact Information

Company	Individual Name	Title	Contact Number
	Antonio Cardenas	Alternate Field Team Leader/SSO	(718) 551-7193 (cell)
East 182 Street Associates LLC	Matthew Kelly	Applicant’s Representative	(212) 243-9090

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description and Surrounding Land Use

The Site consists of an approximately 0.16-acre parcel located at 820 East 182nd Street in the Belmont section of the Bronx, New York, and is identified by the City of New York as Borough of Bronx Tax Block 3111, Lot 59. Currently, the Site is developed with a former Sunoco® gasoline station and a vacant single-story building that formerly housed an auto repair shop and adjoining convenience store. A decommissioned pump island is located in the eastern portion of the lot. The exterior portion of the Site consists of asphalt-paved surfaces. The surrounding area comprises predominantly residential and commercial uses. A surrounding land use map is provided as Figure 3.

2.2 Site Geology, Hydrogeology, and Subsurface Characteristics

Based on the U.S. Geological Survey, Central Park, NY Quadrangle (2013), the Site is between approximately 75 and 80 feet above mean sea level, with the surrounding area topography sloping down in a southerly direction.

Based on USGS mapping, groundwater is anticipated to flow in a southeasterly direction toward the Bronx River. The actual groundwater flow direction can be affected by other factors including bedrock geology, or subsurface openings or obstructions. Groundwater in the Bronx is not used as a source of potable water (the municipal water supply uses upstate reservoirs). Groundwater was not encountered above presumed bedrock during AKRF's Phase II ESA.

The stratigraphy beneath the Site consists of historic fill material (comprising sand, gravel, and silt, with varying amounts of brick and concrete) in the upper 5 feet below surface grade, underlain by sand, silt, clay, and apparent weathered bedrock with fine gravel, down to the maximum boring terminus of 19 feet below grade. Presumed weathered bedrock was encountered between approximately 8 and 19 feet below grade during the March 2021 Phase II ESA.

2.3 Proposed Development Plan

Redevelopment plans are still being prepared; however, the anticipated use post-remediation will include rental housing affordable for a range of household incomes from formerly homeless families to households with income at or below 100% of Area Median Income (AMI). The Applicant would sponsor the rezoning of the Site to R8A (residential) as well as other portions of the surrounding neighborhood. To facilitate completion of the RI, the USTs will be properly closed and removed from the Site and the pump island will be demolished. UST removal and pump island demolition will be conducted under a separate Interim Remedial Measures Work Plan (IRMWP).

2.4 Site History

Available records indicated that the Site was developed with a dwelling and unspecified structure as early as 1901. By 1915, a one- to two-story building, identified as Boulevard Inn, was located in the eastern portion of the Site, in place of the former structures. Stores, dwellings, and an auto garage were present on the Site circa 1950. By 1977, the former structures were demolished, and the Site was developed with one building identified as a gasoline filling station. Historic City Directories indicated that the Site was operated by various automotive-related uses between 1956 and 2017, including Pete's Tune Up Service, Bronx Park Esso Station, Herlan Enterprises, R & O Auto Parts, Gaseteria Oil, Calcano's Service Station Inc., Calcano's Domestic & Foreign Auto Repair, and BP Station. The Applicant has owned the Site since the Site became vacant on May 20, 2021.

3.0 PREVIOUS ENVIRONMENTAL REPORTS

Copies of previous reports prepared for the Site are included in Appendix C, and summarized below:

Phase I Environmental Site Assessment, 95-04 & 95-25 149th Street, 820 East 182nd Street, Bronx, New York, AKRF, Inc., April 2021

AKRF prepared a Phase I ESA for the Site in April 2021, in accordance with American Society for Testing and Materials (ASTM) Standard E1527-13, prior to the Applicant taking ownership of the Site. The Phase I ESA included a review of current and historical Sanborn Fire Insurance maps; state and federal environmental regulatory databases; local records; and reconnaissance of the Site and its surroundings. Based on the findings of the Phase I ESA, the following Recognized Environmental Conditions (RECs)/Historic RECs (HRECs) were identified:

RECs

- The Site was listed as various auto repair facilities and gasoline stations on City Directories and Sanborn maps as early as 1956. The Site was also listed under the EDR US Historic Auto Station database as various auto repair facilities and gasoline stations between 1969 and 2014, the Resource Conservation and Recovery Act (RCRA) database as a non-generator and historic Conditionally Exempt Small Quantity Generator (CESQG) of ignitable waste, the US Aerometric Information Retrieval System (AIRS) database as a minor air pollution source, the Facility Index System (FINDS) database, and the Enforcement and Compliance History Information (ECHO) database with no reported violations, and the NYSDEC Petroleum Bulk Storage (PBS) database under PBS ID 2-188964. The PBS registration listed five in-service 4,000-gallon gasoline USTs installed in 1984, one in-service 1,000-gallon waste oil/used oil UST installed in 1985, one temporarily out of service 1,000-gallon No. 2 fuel oil UST, one 1,000-gallon UST converted to non-regulated use (product stored unknown), and 11 550-gallon USTs closed prior to micro-conversion (product stored unknown). During the reconnaissance, petroleum-like staining was observed throughout the surface of the Site and several unlabeled 55-gallon drums were noted to be in poor condition.
- Database records and City Directories identified a historical dry cleaner, located at 814 East 182nd Street, west-adjacent to the Site. The dry cleaner was identified on the registered and historical dry cleaners database, and RCRA database from 1999 to 2011.
- Sanborn maps and City Directories identified additional proximal automotive, industrial, and dry cleaner uses between 1915 and 2005, including: F&J Service Radio & Television, Crestliner TV & Auto Radio, Gallant Manufacturing Co., C & H Electric Motor Service, Fischer Alfred French Dry Cleaners, Gil's Tire Service, a print shop, a woodworking facility, and a marble works.

HRECs

- The Site was listed with two closed Spills listings: Spill No. 9005411 was reported in July 1990 due to a tank overfill. Contaminated soil was reportedly encountered during the removal of a 550-gallon tank. The listing indicated that the soil would be analyzed and disposed of, but no further pertinent details were provided. The spill was closed in May 1991. Spill No. 9306408 was reported in August 1993. Approximately 3 gallons of gasoline was spilled due to a submerged turbine pump failure. Gasoline was noted on water in one of the manways and was reportedly pumped out. The spill listing also noted further investigation was to be conducted; however, no additional details were provided. The spill was closed in October 1993.

Phase II Environmental Site Assessment, 820 East 182nd Street, Bronx, New York, AKRF, Inc., May 2021

AKRF was retained by the Applicant to conduct a Phase II ESA in March 2021, prior to acquisition of the Site. The scope of work was based on the findings of the April 2021 Phase I ESA prepared by AKRF. The Phase II ESA included a geophysical survey; the advancement of seven soil borings across the Site and collection of up to three soil samples from each boring; and the installation of four temporary soil vapor points with collection of four soil vapor samples. AKRF attempted to install up to three temporary groundwater monitoring wells; however, groundwater was not encountered above presumed bedrock in any of the borings.

Soil borings were advanced across the Site using a Geoprobe® direct-push drill rig. Soil cores were field-screened using a photoionization detector (PID). At each boring location, one soil sample was collected from the 2-foot interval directly below existing pavement and a second sample was collected from the 2-foot interval where the greatest evidence of contamination (e.g., odors, staining, elevated PID readings) was observed. In the absence of evidence of contamination, a sample was collected from the 2-foot interval directly above the bedrock surface, which was encountered between approximately 7 and 19 feet below grade. At soil borings SB-02 and SB-03, a third sample was collected from 8 to 10 feet below grade and 11 to 13 feet below grade, respectively, where additional evidence of contamination was observed. Groundwater was not encountered above bedrock.

Soil beneath the Site consisted of fill material (sand, gravel, silt, concrete, brick, and asphalt) between just below surface grade down to approximately 2 to 5 feet below grade. The fill material was underlain by apparent native soil (sand, silt, and gravel) to 19 feet below grade (the maximum boring terminus). Presumed weathered bedrock was encountered between approximately 7 feet below grade in SB-07 and 19 feet below grade in SB-02. Petroleum-like odors and elevated PID readings were observed in soil borings SB-02, SB-03, and SB-07 up to 713.4 parts per million (ppm).

Exterior soil vapor points SV-01, SV-02, and SV-03 were installed at approximately 2 feet above presumed bedrock, at depths ranging between 15 and 17 feet below grade. Sub-slab soil vapor point SV-04 was installed approximately 12 inches beneath the concrete building slab of the auto repair shop.

Soil and soil vapor laboratory analytical results are summarized below:

Soil

- Volatile organic compounds (VOCs) were detected in 11 of the 16 soil samples. The VOCs 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, acetone, benzene, ethylbenzene, n-propylbenzene, toluene, and total xylenes were detected at concentrations above their respective NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and Protection of Groundwater Soil Cleanup Objectives (PGWSCOs). Concentrations of petroleum-related VOCs were detected up to 72 milligrams per kilogram (mg/kg) (total xylenes in sample 820_SB-03_11-13_20210323). No VOCs were detected at concentrations exceeding the Restricted Residential Soil Cleanup Objectives (RRSCOs).
- Semivolatile organic compounds (SVOCs) were detected at low levels in 13 of the 16 samples. Indeno(1,2,3-cd)pyrene was detected at a concentration of 0.72 mg/kg in sample 820_SB-04_0-2_20210324, just above the UUSCO and RRSCO of 0.5 mg/kg. No other SVOCs were detected above the UUSCOs and RRSCOs.
- Up to 22 of the 23 Target Analyte List (TAL) metals analyzed and hexavalent chromium were detected in all 16 soil samples. Silver was not detected in any soil sample. Of the detections, copper (maximum of 125 mg/kg), hexavalent chromium (maximum of 2.2 mg/kg), lead (maximum of 398 mg/kg), mercury (maximum of 0.65 mg/kg), and zinc (maximum of 357 mg/kg) were detected at concentrations above the UUSCOs, but below the RRSCOs.

- Polychlorinated biphenyls (PCBs) were not detected above laboratory reporting limits in any of the soil samples. One pesticide, P,P'-DDT, was detected in sample 820_SB-01_0-2_20210323 at a concentration of 0.0035 mg/kg, above the UUSCO of 0.0033 mg/kg, but below the RRSCO of 7.9 mg/kg. No other pesticides were detected above laboratory reporting limits.

Soil Vapor

- Elevated concentrations of petroleum-related VOCs were detected in each of the four soil vapor samples. Of note, the VOCs 2,2,4-trimethylpentane, benzene, butane, cyclohexane, n-heptane, n-hexane, and toluene were detected at concentrations up to 360,000,000 micrograms per cubic meter (µg/m^3) (butane in sample 820_SV-03_20210323). The chlorinated solvent, tetrachloroethylene (PCE), was detected at a concentration of 58 µg/m^3 in sample 820_SV-04_20210323.

Soil concentrations above the UUSCOs, RRSCOs, and/or PGWSCOs, and soil vapor detections are shown on Figure 4 and Figure 5, respectively.

3.1 Areas of Concern (AOCs)

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

1. The Site's historic use as a gasoline station and auto repair shop. The Site is registered under PBS ID 2-188964 with five out-of-service 4,000-gallon gasoline USTs, one out-of-service 1,000-gallon waste oil/used oil UST, one temporarily out-of-service 1,000-gallon No. 2 fuel oil UST, one 1,000-gallon UST converted to non-regulated use (product stored unknown), and 11 550-gallon USTs closed prior to micro-conversion (product stored unknown).
2. Elevated concentrations of petroleum-related VOCs detected in soil vapor sampled during a previous investigation.
3. Elevated concentrations of PAHs and metals in soil during a previous investigation.

4.0 FIELD PROGRAM

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

4.1 Field Program Summary

The field work scope of work (SOW) includes: a geophysical survey; the advancement of eight soil borings with the collection and laboratory analysis of at least two soil samples from each soil boring; the installation of six permanent groundwater monitoring wells with the collection and laboratory analysis of six groundwater samples; and the installation of five temporary soil vapor probes with the collection and laboratory analysis of five soil vapor samples. The proposed sample locations are shown on Figure 6.

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, and/or elevated PID readings) will be recorded on logs for inclusion in the RIR. All sampling equipment will be either dedicated or decontaminated between sampling locations.

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

4.2 Geophysical Survey

A geophysical survey, including ground-penetrating radar (GPR) and magnetometry, will be performed across the Site to investigate the presence of potential USTs and underground utilities, and to clear the proposed sampling locations. 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, measure off of fixed points in the field, and surveyed using GPS.

4.3 Soil Boring Advancement and Soil Sampling

A Geoprobe™ direct-push drill rig will be used to advance soil borings RI-SB-01 through RI-SB-08 at the approximate locations shown on Figure 6. Borings RI-SB-02, RI-SB-06, and RI-SB-05 will be advanced following implementation of the IRMWP, including removal of the USTs and pump island. Additional drilling techniques may be required for soil borings that are converted into permanent groundwater monitoring wells. Soil cores will be collected in 5-foot long, 2-inch diameter, stainless steel macrocore piston rod samplers fitted with internal, dedicated acetate liners. Soil borings will be advanced to approximately 15 feet below grade. 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 a calibrated PID, and logged using the modified Burmister soil classification system.

At all soil boring locations, one soil sample will be collected for analysis from the upper 2 feet below existing pavement, and a second soil sample will be collected for analysis from 13-15 feet below grade. A third sample may be collected from any additional intervals displaying field evidence of contamination (e.g., elevated PID readings, odors, staining, etc.).

Soil samples slated for laboratory analysis will be labeled and placed in laboratory-supplied containers and shipped to the laboratory via a courier with chain-of-custody (COC) documentation 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 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, hexavalent chromium by EPA Method 7196A, per- and polyfluorinated compounds (PFAS) by Modified EPA Method 537.1, and 1,4-dioxane by EPA Method 8270.

After each boring is completed, the boreholes will be filled with on-site materials (if not noticeably contaminated) in accordance with Section 3.3(e) of DER-10. Soil cuttings displaying field evidence of contamination will be containerized in properly labeled Department of Transportation (DOT)-approved 55-gallon drums for 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 in contact with environmental media will be double bagged and disposed of as municipal trash as non-hazardous refuse.

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

Table 2
Proposed Soil Sample Rationale

Sample Location	Sample Intervals For Laboratory Analysis[1]	On-Site Location	Rationale
RI-SB-01	0-2’ and 13-15’	Western	To assess soil quality in the western portion of the Site
RI-SB-02	0-2’ and 13-15’	Northern	To assess soil quality in the northern portion of the Site around the USTs
RI-SB-03	0-2’ and 13-15’	Southeastern	To assess soil quality in the southeastern portion of the Site
RI-SB-04	0-2’ and 13-15’	Central	To assess soil quality in the central portion of the Site
RI-SB-05	0-2’ and 13-15’	Eastern	To assess soil quality in the eastern portion of the Site beneath the pump island
RI-SB-06	0-2’ and 13-15’	Northern	To assess soil quality in the northern portion of the Site around the USTs
RI-SB-07	0-2’ and 13-15’	Northeastern	To assess soil quality in the northeastern portion of the Site
RI-SB-08	0-2’ and 13-15’	South	To assess soil quality in the south portion of the Site

Notes:
1. Indicates sample depth below existing pavement/building slab.
2. Additional samples may be collected from one or several borings if field evidence of contamination is observed.

4.4 Groundwater Monitoring Well Installation and Development

Six permanent monitoring wells (denoted as RI-MW-01 through RI-MW-06) will be installed using a Geoprobe™ direct-push drill rig or Sonic drill rig at the proposed locations shown on Figure 6. Monitoring wells RI-MW-02, RI-MW-05, and RI-MW-06 will be advanced following implementation of the IRMWP, including removal of the USTs and pump island. The wells will be constructed with 10 feet of 2-inch diameter 0.002-inch slotted polyvinyl chloride (PVC) well screen set approximately 5 feet below the water table and 5 feet above the water table, and a 2-inch diameter solid PVC riser installed to grade. The boreholes will be at least 6 inches in diameter to allow for a minimum 2-inch annular space surrounding the monitoring well. A No. 2 morie sandpack will be installed from the base of the well to approximately 2 feet above the well screen. The annular space around the solid well riser above the sandpack will be sealed with approximately 2 feet of bentonite followed by a non-shrinking grout/cement mixture to approximately one foot below grade. Each of the wells will be finished with a locking j-plug and flush-mounted well cover with a concrete pad. 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 soil sample locations is summarized in Table 3.

Table 3
Proposed Groundwater Sample Rationale

Groundwater Monitoring Well ID	On-Site Location	Rationale
RI-MW-01	Western	To assess groundwater quality on the western portion of the Site; and determine Site-specific groundwater flow direction and elevation.
RI-MW-02	Northern	To assess groundwater quality on the northern portion of the Site around the USTs; and determine Site-specific groundwater flow direction and elevation.
RI-MW-03	Southeastern	To assess groundwater quality on the southeastern portion of the Site; and determine Site-specific groundwater flow direction and elevation.
RI-MW-04	Central	To assess groundwater quality on the central portion of the Site; and determine Site-specific groundwater flow direction and elevation.
RI-MW-05	Eastern	To assess groundwater quality on the eastern portion of the Site beneath the pump island; and determine Site-specific groundwater flow direction and elevation.
RI-MW-06	Northern	To assess groundwater quality beneath the USTs; and determine Site-specific groundwater flow direction and elevation.

4.5 Groundwater Elevation Survey

The groundwater 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 NAVD 88 Elevation Datum. 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 a bailer will be used to measure any separate phase liquid. The purge water will be monitored for turbidity and water quality indicators [i.e., pH, dissolved oxygen, oxidation-reduction potential (ORP), 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. All purge water 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 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, PFAS by Modified EPA Method 537.1, and 1,4-dioxane by EPA Method 8270 selected ion monitoring (SIM) using Category B deliverables. Filtering will occur in the field. Sampling for PFAS will be conducted in accordance with the June 2021 NYSDEC-issued sampling protocol, with the exception that a low-density polyethylene (LDPE) bladder will be used as no industry-approved high-density polyethylene (HDPE) alternative currently exists. Well sampling details will be noted on groundwater sampling logs, included as an appendix to the RIR.

4.7 Soil Vapor Sampling

Five soil vapor samples (denoted as RI-SV-01 through RI-SV-03, RI-SV-07, and RI-SV-08) will be collected from five temporary vapor monitoring probes at the approximate locations shown on Figure 6. Soil vapor point RI-SV-01 will be installed as a sub-slab point approximately 6 inches beneath the building slab. The remaining four locations will be installed at approximately 2 feet above the water table. Soil vapor point RI-SV-02 will be advanced following implementation of the IRMWP Soil vapor 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, revised 2017)."

The temporary sub-slab and soil vapor points will be installed by advancing an expendable drive point using either a direct-push drill rig, a slide hammer, or hammer drill to the target sampling depth. At each monitoring point, a 6-inch stainless steel screen implant, connected to Teflon tubing will be installed by hand or 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 3 to 6 inches above the screen. Hydrated bentonite will be used to fill the remaining void around the sampling tubing to the ground surface.

Soil vapor samples RI-SV-01 through RI-SV-03, RI-SV-07, and RI-SV-08 sample will be collected over a 2-hour time period from each monitoring point or location 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.

Prior to sample collection, the soil vapor sampling points will be purged of three sample volumes using a GilAir air sampling pump. During purging, a shroud will be placed over the sampling point and helium gas will be introduced 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 used to enhance the surface seal, and the point will be retested.

Following purging, a soil vapor sample will be collected using the vacuum from the SUMMA® canister. Immediately after opening the flow control valve equipped with a two-hour regulator, 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 by a NYSDOH ELAP-certified laboratory with Category B deliverables. Samples will be shipped to the laboratory with appropriate COC documentation.

The rationale for the proposed soil vapor samples is summarized in Table 4.

Table 4
Proposed Soil Vapor Sample Rationale

Vapor Point ID	Sample Location	Rationale
RI-SV-01	Western	To determine concentrations of VOCs on the western portion of the Site, evaluate the potential for off-site exposure to the west, and determine if there is a vapor intrusion concern.
RI-SV-02	Northern	To determine concentrations of VOCs on the northern portion of the Site, evaluate the potential for off-site exposure to the northwest, and determine if there is a vapor intrusion concern.
RI-SV-03	Southeastern	To determine concentrations of VOCs on the southeastern portion of the Site, evaluate the potential for off-site exposure to the south, and if there is a vapor intrusion concern.
RI-SV-07	Northeastern	To determine concentrations of VOCs on the northeastern portion of the Site and determine if there is a vapor intrusion concern.
RI-SV-08	Southern	To determine concentrations of VOCs on the southern portion of the Site, evaluate the potential for off-site exposure to the southwest, and determine if there is a vapor intrusion concern.

4.8 Quality Assurance/Quality Control (QA/QC)

The analytical results will be reported using Category B deliverables. As required by the Category B sampling techniques, additional analysis will be included for QC measures. The QA/QC samples for soil and groundwater will include 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 one sample per 20 field samples per media. The field blank, blind duplicate, and MS/MSD samples will be analyzed for the same analyte list as the accompanying field samples. The laboratory-prepared trip blanks will be submitted for analysis of VOCs only to determine the potential for cross-contamination. QA/QC samples accompanying the soil and groundwater samples will also be analyzed for PFAS by Modified EPA Method 537.1 and 1,4-dioxane by EPA Method 8270 (SIM analysis will be used for groundwater samples). Additionally, one equipment blank will be collected for each day of groundwater sampling and analyzed for PFAS by Modified EPA Method 537.1 only.

Upon receipt of the analytical data from the laboratory, it will be reviewed by a third-party data validator, who will prepare a Data Usability summary Report (DUSR). The QAPP, included as Appendix A, describes the QA/QC protocols and procedures that will be followed during implementation of this RIWP.

4.9 Decontamination Procedures

All non-dedicated sampling equipment 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.

Non-dedicated equipment used for soil and groundwater sampling of emerging contaminants will be decontaminated with laboratory-certified PFAS-free water.

4.10 Management of Investigation-Derived Waste (IDW)

IDW that does not exhibit field evidence of contamination will be used to backfill the corresponding borehole that generated them to within 12 inches of the surface. Soil IDW exhibiting evidence of gross contamination will be containerized in DOT-approved 55-gallon drums. All development and purge groundwater will be containerized in 55-gallon drums. The drums will be sealed at the end of each work day 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 backfill. 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 that will: document field activities; present field and laboratory data; evaluate exposure pathways in an exposure assessment; identify and characterize the source(s) of contamination; 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

The RIR will include a section that 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 Assessment

The RIR will include a section that presents field and laboratory data for soil results. The section will include a description of soil characteristics and figures will be provided that illustrate soil boring locations. Field and laboratory analytical results will be presented in the body of the report, 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 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. The 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 elevation contour map and determine the inferred 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 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. The section will include a description of soil vapor characteristics and will provide a comparison of soil vapor and indoor air 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. Soil vapor sample 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)

The RIR will include a QHHEA, which will be performed in accordance with DER-10 Section 3.3(c)4 and Appendix 3B.

6.0 PROPOSED PROJECT SCHEDULE

Table 5
Proposed Project Schedule

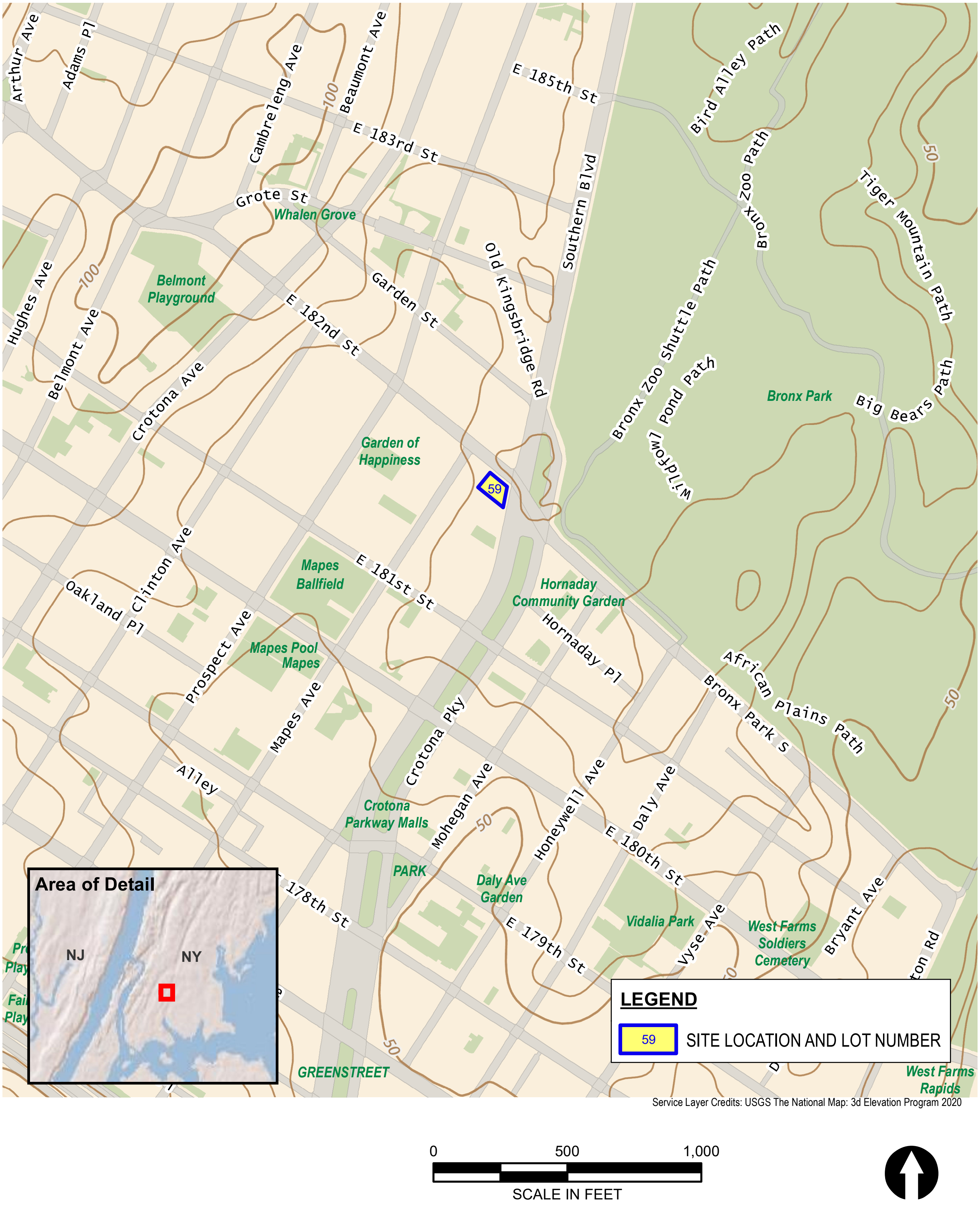
Activity	Time To Complete
Submittal of Draft RIWP	December 15, 2021
Distribute Fact Sheet/RIWP Public Comment Period Is Initiated	February 2022
Submittal of Draft Interim Remedial Measures Work Plan (IRMWP)	March 2022
RIWP Comments Received	April 2022
Final RIWP Submitted	May 2022
Distribute Fact Sheet/IRMWP Public Comment Period is Initiated	May 2022
Remedial Investigation and submittal of Draft RIR	June 2022 – December 2023
NYSDEC Approves IRMWP	August 2022
IRM Implementation and submittal of draft IRM Report	September 2022 – August 2023
NYSDEC Approves IRM Report	November 2023
NYSDEC Approves RIR and Issues Significant Threat Determination	December 2024
RAWP Preparation	January 2024 – July 2024
45-day Public Comment Period for RAWP	November 2024
NYSDEC Approves RAWP and Issues Decision Document	February 2025
Issue Remedial/Construction Notice Fact Sheet	March 2025
Begin Implementation of RAWP	April 2025
Execution of Environmental Easement (if required)	July 2026
Draft Site Management Plan (SMP) Submitted to NYSDEC	August 2026
Draft Final Engineering Report and Fact Sheet	September 2026
Certificate of Completion and Fact Sheet	December 2026
Completion of Building (first occupancy)	December 2028

7.0 CERTIFICATION

I, Deborah Shapiro, 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		DRAFT
Name	*Signature*	*Date*

FIGURES



Service Layer Credits: USGS The National Map: 3d Elevation Program 2020

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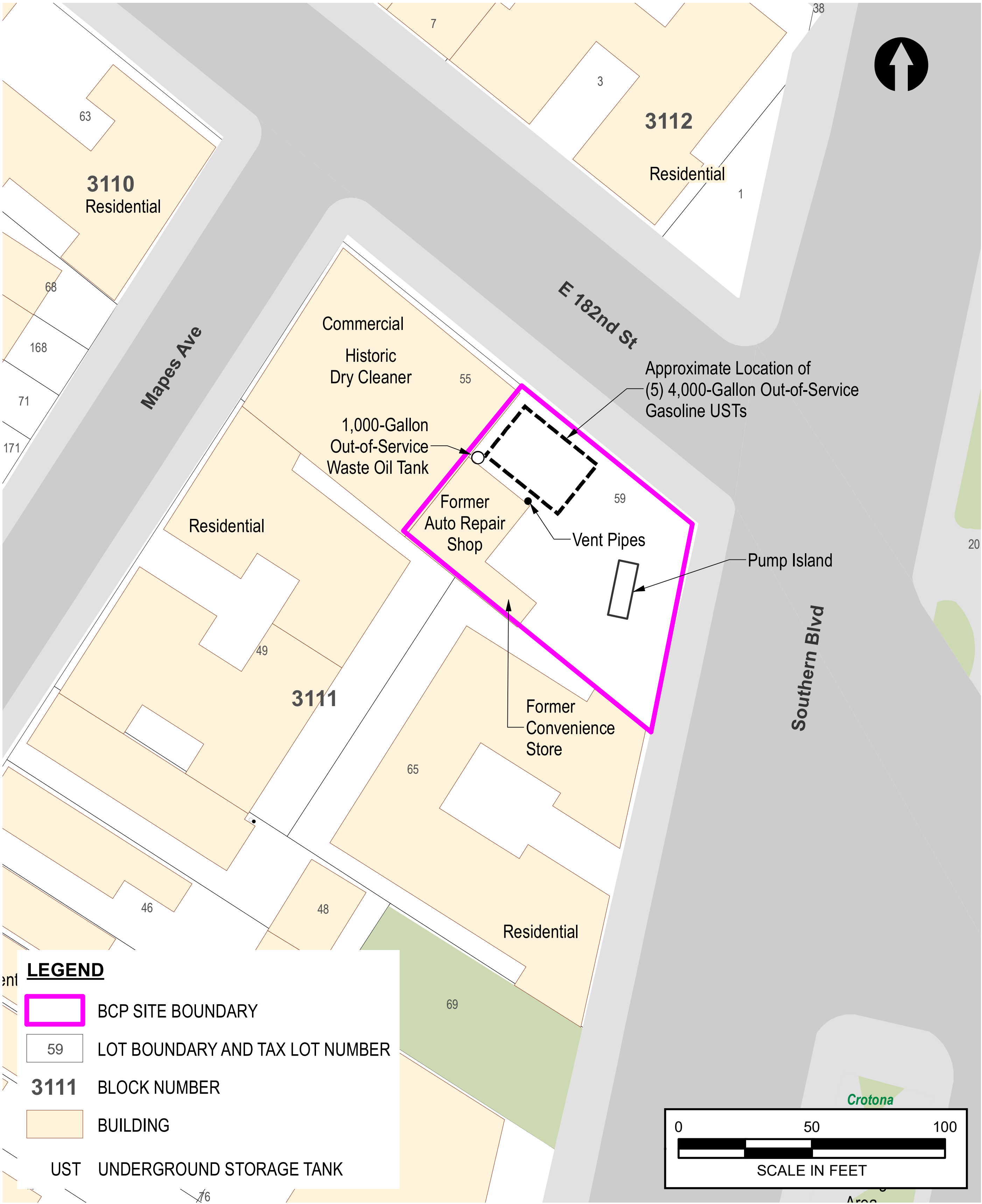
820 East 182nd Street
Bronx, New York

SITE LOCATION

DATE	**7/13/2021**
PROJECT NO.	**210138**
FIGURE	**1**



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

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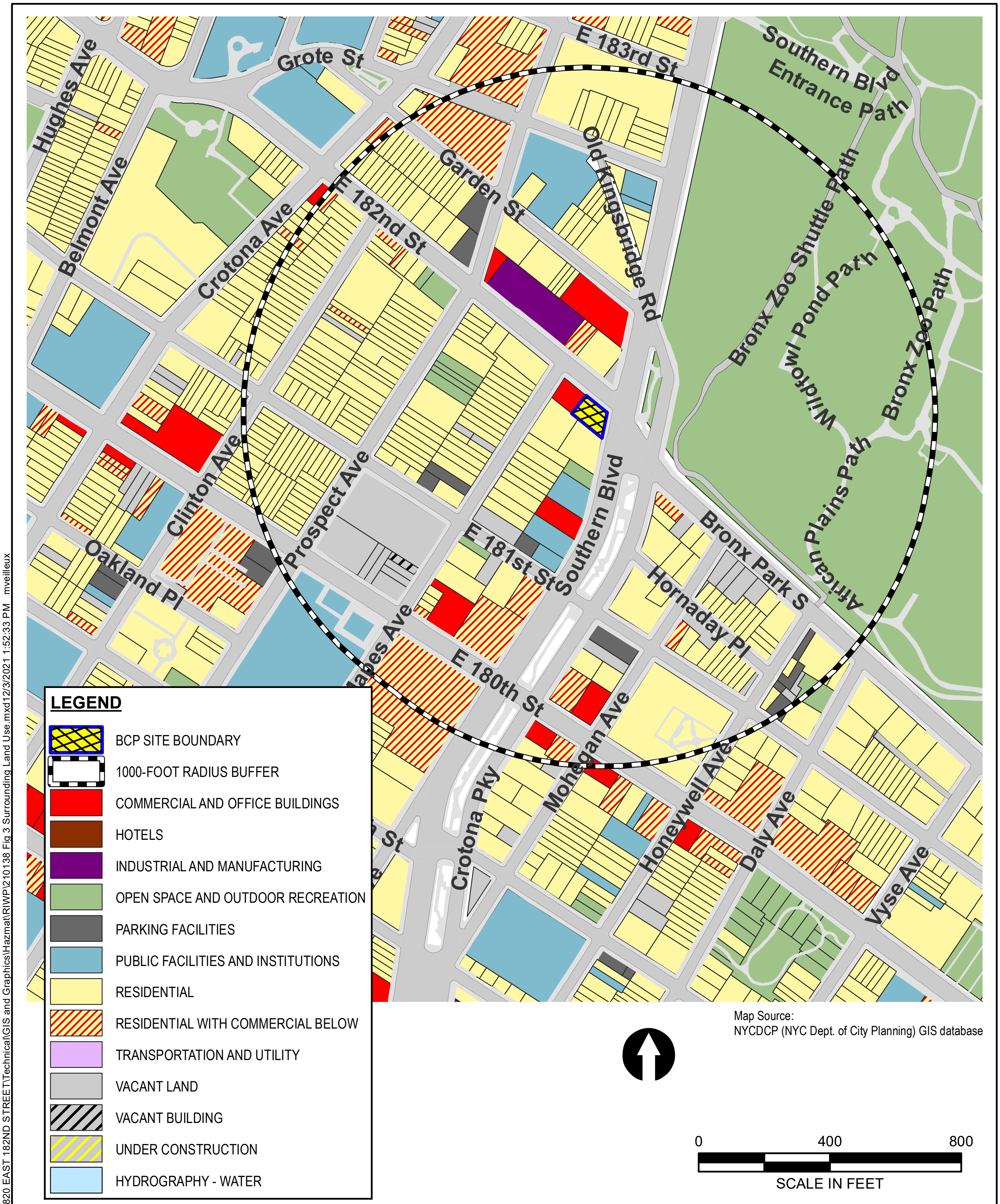
SITE PLAN

DATE
7/13/2021

PROJECT NO.
210138

FIGURE
2

©2021 AKRF W:\Projects\210138 - 820 EAST 182ND STREET\Technical\GIS and Graphics\Hazmat\210138 Fig 2 Site Plan.mxd7/13/2021 3:42:02 PM mveilleux



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

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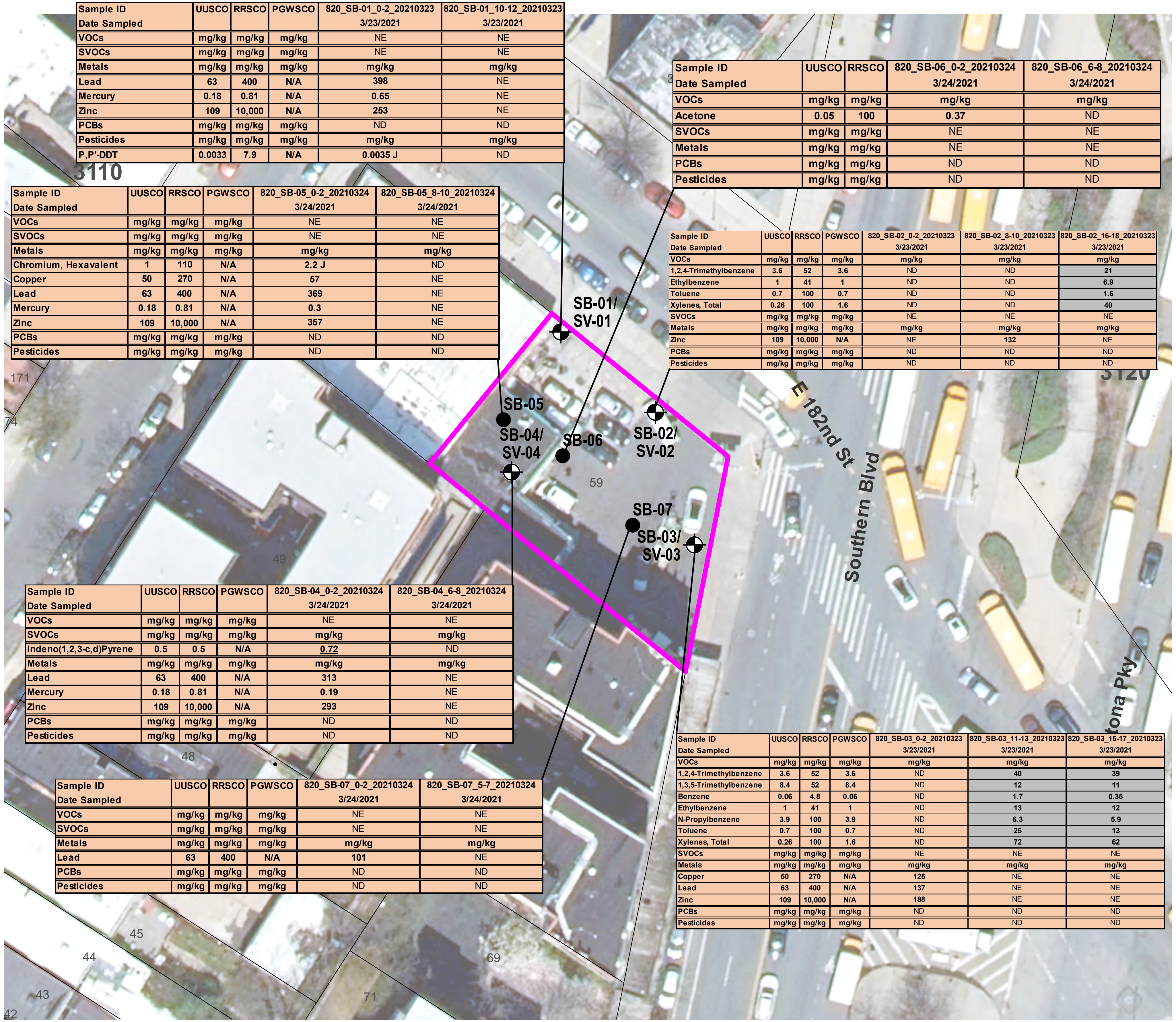
SURROUNDING LAND USE

DATE
12/3/2021

PROJECT NO.
210138

FIGURE
3



Sample ID Date Sampled	UUSCO	RRSCO	PGWSCO	820_SB-01_0-2_20210323 3/23/2021	820_SB-01_10-12_20210323 3/23/2021
VOCs	mg/kg	mg/kg	mg/kg	NE	NE
SVOCs	mg/kg	mg/kg	mg/kg	NE	NE
Metals	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Lead	63	400	N/A	**398**	NE
Mercury	0.18	0.81	N/A	**0.65**	NE
Zinc	109	10,000	N/A	**253**	NE
PCBs	mg/kg	mg/kg	mg/kg	ND	ND
Pesticides	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
P,P'-DDT	0.0033	7.9	N/A	**0.0035 J**	ND

Sample ID Date Sampled	UUSCO	RRSCO	820_SB-06_0-2_20210324 3/24/2021	820_SB-06_6-8_20210324 3/24/2021
VOCs	mg/kg	mg/kg	mg/kg	mg/kg
Acetone	0.05	100	**0.37**	ND
SVOCs	mg/kg	mg/kg	NE	NE
Metals	mg/kg	mg/kg	NE	NE
PCBs	mg/kg	mg/kg	ND	ND
Pesticides	mg/kg	mg/kg	ND	ND

Sample ID Date Sampled	UUSCO	RRSCO	PGWSCO	820_SB-05_0-2_20210324 3/24/2021	820_SB-05_8-10_20210324 3/24/2021
VOCs	mg/kg	mg/kg	mg/kg	NE	NE
SVOCs	mg/kg	mg/kg	mg/kg	NE	NE
Metals	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Chromium, Hexavalent	1	110	N/A	**2.2 J**	ND
Copper	50	270	N/A	**57**	NE
Lead	63	400	N/A	**369**	NE
Mercury	0.18	0.81	N/A	**0.3**	NE
Zinc	109	10,000	N/A	**357**	NE
PCBs	mg/kg	mg/kg	mg/kg	ND	ND
Pesticides	mg/kg	mg/kg	mg/kg	ND	ND

Sample ID Date Sampled	UUSCO	RRSCO	PGWSCO	820_SB-02_0-2_20210323 3/23/2021	820_SB-02_8-10_20210323 3/23/2021	820_SB-02_16-18_20210323 3/23/2021
VOCs	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1,2,4-Trimethylbenzene	3.6	52	3.6	ND	ND	**21**
Ethylbenzene	1	41	1	ND	ND	**6.9**
Toluene	0.7	100	0.7	ND	ND	**1.6**
Xylenes, Total	0.26	100	1.6	ND	ND	**40**
SVOCs	mg/kg	mg/kg	mg/kg	NE	NE	NE
Metals	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Zinc	109	10,000	N/A	NE	**132**	NE
PCBs	mg/kg	mg/kg	mg/kg	ND	ND	ND
Pesticides	mg/kg	mg/kg	mg/kg	ND	ND	ND

Sample ID Date Sampled	UUSCO	RRSCO	PGWSCO	820_SB-04_0-2_20210324 3/24/2021	820_SB-04_6-8_20210324 3/24/2021
VOCs	mg/kg	mg/kg	mg/kg	NE	NE
SVOCs	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	N/A	**<u>0.72</u>**	ND
Metals	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Lead	63	400	N/A	**313**	NE
Mercury	0.18	0.81	N/A	**0.19**	NE
Zinc	109	10,000	N/A	**293**	NE
PCBs	mg/kg	mg/kg	mg/kg	ND	ND
Pesticides	mg/kg	mg/kg	mg/kg	ND	ND

Sample ID Date Sampled	UUSCO	RRSCO	PGWSCO	820_SB-03_0-2_20210323 3/23/2021	820_SB-03_11-13_20210323 3/23/2021	820_SB-03_15-17_20210323 3/23/2021
VOCs	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1,2,4-Trimethylbenzene	3.6	52	3.6	ND	**40**	**39**
1,3,5-Trimethylbenzene	8.4	52	8.4	ND	**12**	**11**
Benzene	0.06	4.8	0.06	ND	**1.7**	**0.35**
Ethylbenzene	1	41	1	ND	**13**	**12**
N-Propylbenzene	3.9	100	3.9	ND	**6.3**	**5.9**
Toluene	0.7	100	0.7	ND	**25**	**13**
Xylenes, Total	0.26	100	1.6	ND	**72**	**62**
SVOCs	mg/kg	mg/kg	mg/kg	NE	NE	NE
Metals	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Copper	50	270	N/A	**125**	NE	NE
Lead	63	400	N/A	**137**	NE	NE
Zinc	109	10,000	N/A	**188**	NE	NE
PCBs	mg/kg	mg/kg	mg/kg	ND	ND	ND
Pesticides	mg/kg	mg/kg	mg/kg	ND	ND	ND

Sample ID Date Sampled	UUSCO	RRSCO	PGWSCO	820_SB-07_0-2_20210324 3/24/2021	820_SB-07_5-7_20210324 3/24/2021
VOCs	mg/kg	mg/kg	mg/kg	NE	NE
SVOCs	mg/kg	mg/kg	mg/kg	NE	NE
Metals	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Lead	63	400	N/A	**101**	NE
PCBs	mg/kg	mg/kg	mg/kg	ND	ND
Pesticides	mg/kg	mg/kg	mg/kg	ND	ND

Aerial Source:
2018 New York State ITS GIS Orthoimagery

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

LEGEND

▭	BCP SITE BOUNDARY
59	LOT BOUNDARY AND TAX LOT NUMBER
3111	BLOCK NUMBER
●	SOIL BORING LOCATION
⊕	SOIL BORING/SOIL VAPOR POINT LOCATION

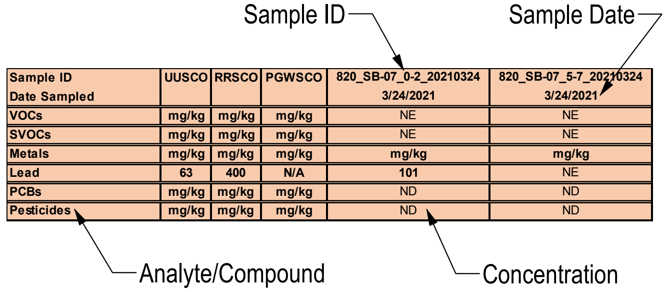
Part 375 Soil Cleanup Objectives (SCOs): SCOs listed in the New York State Department of Environmental Conservation (NYSDEC) "Part 375" Regulations (6 NYCRR Part 375).

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 <u>underline</u>.
Petroleum VOC Exceedances of NYSDEC Protection of Groundwater Soil Cleanup Objectives (PGWSCOs) are presented in gray shading.

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

J: The concentration given is an estimated value.
U: The analyte was not detected at the indicated concentration.
N/A: Not applicable
ND: Not detected
NE: No exceedance

	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
Acetone	0.05	100	0.05
Benzene	0.06	4.8	0.06
Ethylbenzene	1	41	1
N-Propylbenzene	3.9	100	3.9
Toluene	0.7	100	0.7
Xylenes, Total	0.26	100	1.6
Semivolatile Organic Compounds			
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	
Pesticides			
P,P'-DDT	0.0033	7.9	
Metals			
Chromium, Hexavalent	1	110	
Copper	50	270	
Lead	63	400	
Mercury	0.18	0.81	
Zinc	109	10000	



Sample ID Date Sampled	UUSCO	RRSCO	PGWSCO	820_SB-07_0-2_20210324 3/24/2021	820_SB-07_5-7_20210324 3/24/2021
VOCs	mg/kg	mg/kg	mg/kg	NE	NE
SVOCs	mg/kg	mg/kg	mg/kg	NE	NE
Metals	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Lead	63	400	N/A	101	NE
PCBs	mg/kg	mg/kg	mg/kg	ND	ND
Pesticides	mg/kg	mg/kg	mg/kg	ND	ND

0 40 80
SCALE IN FEET

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

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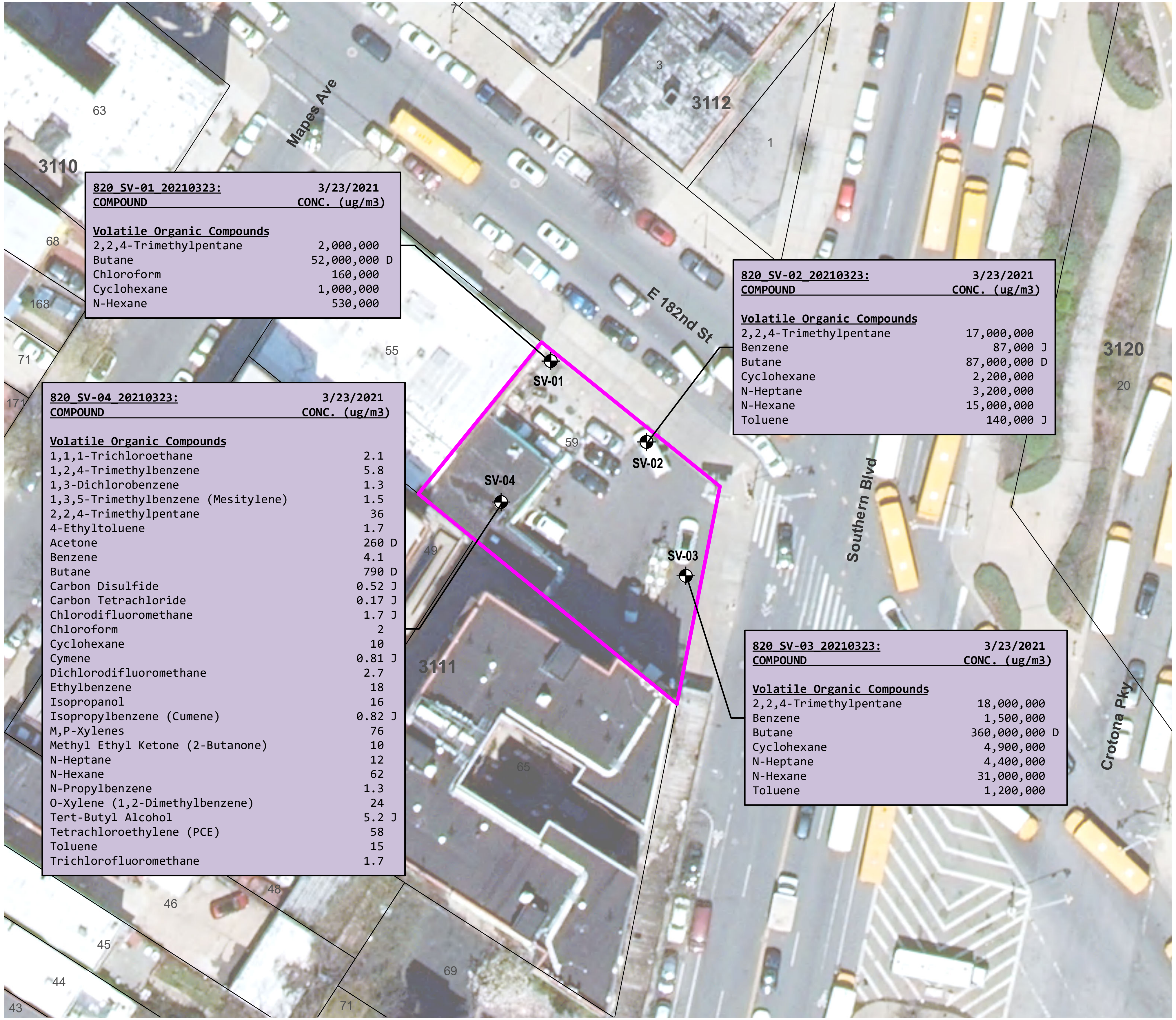
210138

FIGURE
4

©2021 AKRF W:\Projects\210138 - 820 EAST 182ND STREET\Technical\GIS and Graphics\Hazmat\RIWP\210138 Fig 4 Soil Sample Concs.mxd12/3/2021 2:09:49 PM mveilleux



820_SV-01_20210323: COMPOUND	3/23/2021 CONC. (ug/m3)
Volatile Organic Compounds	
2,2,4-Trimethylpentane	2,000,000
Butane	52,000,000 D
Chloroform	160,000
Cyclohexane	1,000,000
N-Hexane	530,000

820_SV-02_20210323: COMPOUND	3/23/2021 CONC. (ug/m3)
Volatile Organic Compounds	
2,2,4-Trimethylpentane	17,000,000
Benzene	87,000 J
Butane	87,000,000 D
Cyclohexane	2,200,000
N-Heptane	3,200,000
N-Hexane	15,000,000
Toluene	140,000 J

820_SV-04_20210323: COMPOUND	3/23/2021 CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	2.1
1,2,4-Trimethylbenzene	5.8
1,3-Dichlorobenzene	1.3
1,3,5-Trimethylbenzene (Mesitylene)	1.5
2,2,4-Trimethylpentane	36
4-Ethyltoluene	1.7
Acetone	260 D
Benzene	4.1
Butane	790 D
Carbon Disulfide	0.52 J
Carbon Tetrachloride	0.17 J
Chlorodifluoromethane	1.7 J
Chloroform	2
Cyclohexane	10
Cymene	0.81 J
Dichlorodifluoromethane	2.7
Ethylbenzene	18
Isopropanol	16
Isopropylbenzene (Cumene)	0.82 J
M,P-Xylenes	76
Methyl Ethyl Ketone (2-Butanone)	10
N-Heptane	12
N-Hexane	62
N-Propylbenzene	1.3
O-Xylene (1,2-Dimethylbenzene)	24
Tert-Butyl Alcohol	5.2 J
Tetrachloroethylene (PCE)	58
Toluene	15
Trichlorofluoromethane	1.7

820_SV-03_20210323: COMPOUND	3/23/2021 CONC. (ug/m3)
Volatile Organic Compounds	
2,2,4-Trimethylpentane	18,000,000
Benzene	1,500,000
Butane	360,000,000 D
Cyclohexane	4,900,000
N-Heptane	4,400,000
N-Hexane	31,000,000
Toluene	1,200,000

Aerial Source:
2018 New York State ITS GIS Orthoimagery

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

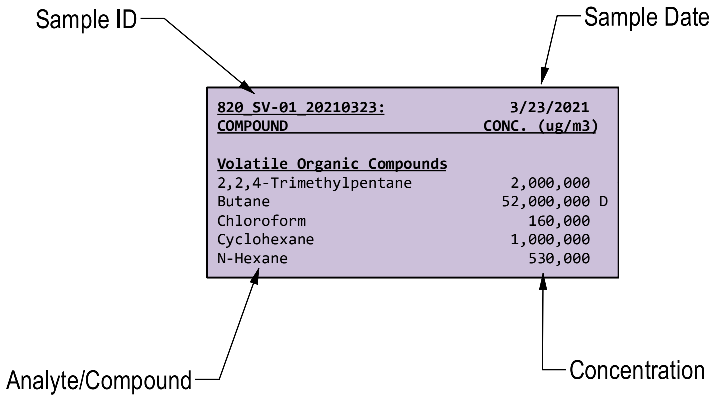
LEGEND

🟪	BCP SITE BOUNDARY
59	LOT BOUNDARY AND TAX LOT NUMBER
3111	BLOCK NUMBER
⌖	SOIL VAPOR POINT LOCATION

µg/m³- micrograms per cubic meter

D: Analyte concentration obtained from dilution.

J: The concentration given is an estimated value.



820_SV-01_20210323: COMPOUND	3/23/2021 CONC. (ug/m3)
Volatile Organic Compounds	
2,2,4-Trimethylpentane	2,000,000
Butane	52,000,000 D
Chloroform	160,000
Cyclohexane	1,000,000
N-Hexane	530,000

0 40 80
SCALE IN FEET

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SOIL VAPOR SAMPLE DETECTIONS

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12/3/2021
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FIGURE
5

LEGEND

▭ BCP SITE BOUNDARY

59 LOT BOUNDARY AND TAX LOT NUMBER

3111 BLOCK NUMBER

● PHASE II SOIL BORING LOCATION (MARCH 2021)

⊕ PHASE II SOIL BORING/SOIL VAPOR POINT LOCATION (MARCH 2021)

○ PROPOSED SOIL BORING LOCATION

⊠ PROPOSED SOIL BORING/MONITORING WELL LOCATION

PROPOSED SOIL BORING/SOIL VAPOR POINT LOCATION

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

0 20 40
SCALE IN FEET

Aerial Source:
2018 New York State ITS GIS Orthoimagery

Map Source:
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820 East 182nd Street
Bronx, New York

PROPOSED SAMPLE LOCATION PLAN

DATE
12/13/2021

PROJECT NO.
210138

FIGURE
6

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

MAPES EAST 182 STREET

BRONX, NEW YORK

Quality Assurance Project Plan

NYSDEC BCP Site Number: C203149
AKRF Project Number: 210138

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:

East 182 Street Associates, LLC
902 Broadway, 13th Floor
New York, NY 10010

Prepared by:

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

DECEMBER 2021

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 the Remedial Investigation Work Plan (RIWP) for the Mapes East 182 Street site located at 820 East 182nd Street in the Belmont section of the Bronx, New York, hereafter referred to as the "Site." The Site is identified by the City of New York as Borough of Queens, Block 3111, Lot 59. The objective of this QAPP is to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental investigative and sampling activities conducted under the New York State Department of Environmental Conservation (NYSDEC) oversight in the Brownfield Cleanup Program (BCP) (BCP Site No. C203149). Adherence to this QAPP will ensure that defensible data will be obtained during 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 Project Director

Ms. Deborah Shapiro, QEP, will serve as the project director and will be responsible for adherence to the QAPP including quality assurance/quality control (QC/QC). The project director 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 project director 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/Participant, and/or the NYSDEC. Adrianna Bosco will serve as the project manager for the RIWP. Ms. Bosco's resume is included in Attachment A.

2.3 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 work plan and Health and Safety Plan (HASP), included as Appendix A of the RIWP. The field team leader will also act as the field technician and Site Safety Officer (SSO) and will report to the project manager or project manager alternate 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. Tim Larigan will be the field team leader. The field team leader alternate is Antonio Cardenas of AKRF. Mr. Larigan's and Mr. Cardenas' resumes are included in Attachment A.

2.4 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 (TestAmerica), the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory being employed for all environmental sampling at the Site.

2.5 Thirty-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 Northport, 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 tap water/Alconox® mixture and bristle brush.
2. Rinse with tap water.
3. Scrub again with 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 work day 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 10.6 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 4.6.1, and place in an ice-filled cooler for shipment to the laboratory. Samples analyzed for the emerging contaminants, per- and polyfluorinated compounds (PFAS), should be contained in a separate cooler and the sample containers should be labeled with ballpoint pen, not permanent marker.
- 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 Groundwater Sampling

Groundwater sampling will be conducted according to the following procedures:

- Field screen the sample for evidence of contamination (e.g., odors, staining, etc.) using visual and olfactory methods and screen the well headspace for VOCs using a PID equipped with an 10.6 eV lamp.
- Collect the groundwater sample from each proposed sample location in laboratory-supplied glassware, label the sample in accordance with Section 4.6.1, and place in an ice-filled cooler for shipment to the laboratory. Samples analyzed for the emerging contaminants, PFAS, should be contained in a separate cooler and the sample containers should be labeled with ballpoint pen, not permanent marker.
- Complete the proper COC paperwork and seal the cooler.
- Record sample location, sample depth, and sample observations (evidence of contamination, PID readings, free phase liquid, etc.) in field log book and boring log data sheet, if applicable.
- Decontaminate any groundwater sampling equipment between sample locations as described in Section 3.1 of this QAPP.

4.3 Soil Vapor Sampling

Soil vapor sampling will be conducted according to the following procedures:

- Field screen the sample for evidence of contamination (e.g., odors, etc.) using olfactory methods and screen the purged vapors for VOCs using a PID equipped with an 10.6 eV lamp.

- Collect the soil vapor samples from each proposed sample locations in laboratory-supplied SUMMA® canisters, label the sample in accordance with Section 4.6.1, and place in shipment container for shipment to the laboratory.
- Complete the proper COC paperwork and seal the shipment container.
- Record sample location, sample depth, and sample observations (odors, PID readings, etc.) in field log book and boring log data sheet, if applicable.

4.4 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. TestAmerica of Edison, New Jersey, 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	Volatile Organic Compounds (VOCs)	8260C	EnCore® samplers (3) and 2 oz. plastic jar	≤ 6 ºC	48 hours to extract; 14 days to analyze
	Semivolatile Organic Compounds (SVOCs)	8270D	8 oz. Glass Jar	≤ 6 ºC	14 days to extract; 40 days to analyze
	1,4-Dioxane	8270D; 0.1 mg/kg RL	4 oz. Glass Jar	≤ 6 ºC	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 ºC	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 ºC	14 days to extract; 40 days to analyze
	Polychlorinated Biphenyls (PCBs)	8082A	8 oz. Glass Jar	≤ 6 ºC	14 days to extract; 40 days to analyze
	Per- and Polyfluorinated Compounds (PFAS)	Modified 537.1; 0.2 ng/L RL	4 oz. HDPE Plastic Container	≤ 6 ºC	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 ºC	48 hours to extract; 14 days to analyze
	SVOCs	8270D	2,000 mL Amber Jar	≤ 6 ºC	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 ºC	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 hex. chromium
	Pesticides	8081B	2,000 mL Amber Jar	≤ 6 ºC	7 days to extract; 40 days to analyze
	PCBs	8082A	2,000 mL Amber Jar	≤ 6 ºC	7 days to extract; 40 days to analyze
	Per- and Polyfluorinated Compounds (PFAS)	Modified 537; 0.2 ng/L RL	3 x 250 mL Polypropylene Bottles	≤ 6 ºC, Trizma	14 days to analyze
Soil Vapor	VOCs	TO-15	6L SUMMA® Canister	None	14 days

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

4.5 Quality Control (QC) Sampling

In addition to the laboratory analysis of the soil and groundwater samples, additional analysis will be included for QC measures, as required by the Category B sampling techniques. These samples will include a field blank, trip blank, matrix spike/matrix spike duplicate (MS/MSD), and blind duplicate samples at a frequency of one sample per 20 field samples collected or per sample delivery 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. Additionally, one equipment blank will be collected during each day of groundwater sampling.

4.6 Sample Handling

4.6.1 Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody (COC) documents, and laboratory reports. Soil, groundwater, and soil vapor samples collected during the RI will be identified with “RI-” and “SB-” for soil borings “MW-” for groundwater monitoring wells, and “SV-” for soil vapor points, and the soil boring, groundwater monitoring well number, or soil vapor point sample number. All samples will be amended with the collection date at the end of the sample name in a year, month, day (YYYYMMDD) format. Blind duplicate sample nomenclature will consist of the sample type, followed by an “X”; MS/MSD samples 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 sample digestion group (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
Remedial Investigation Sample Nomenclature

Sample Description	Sample Designation
Groundwater sample collected from groundwater monitoring well RI-MW-01 on June 13, 2022	RI-MW-01_20220613
Blind duplicate sample of groundwater sample collected from groundwater monitoring well RI-MW-01 on June 13, 2022	RI-MW-X_20220613
Second field blank collected during the RI on June 8, 2022 with the soil samples	RI-FB-S-02_20220608
Soil sample collected from soil boring RI-SB-01 between 0 and 2 feet below grade on June 8, 2022	RI-SB-01_0-2_20220608
Second blind duplicate soil sample of SDG collected from soil boring RI-SB-05 between 0 and 2 feet below grade on June 10, 2022	RI-SB-X2_0-2_20220610
Soil vapor sample collected from temporary soil vapor point RI-SV-01 on June 8, 2022	RI-SV-01_20220608

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; and 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.

4.7 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 10.6 eV lamp and will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas in accordance with the manufacturer's standards.

4.8 Quality Assurance (QA)

All soil, groundwater, and soil vapor laboratory analytical data will be reviewed by a third-party validator and a Data Usability Summary Report (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, concentration map showing sample locations and concentrations, DUSR, and laboratory reports.

ATTACHMENT A

RESUMES OF QA/QC OFFICER AND PROJECT DIRECTOR, PROJECT MANAGER, AND FIELD TEAM LEADER/FIELD TECHNICIAN/SITE SAFETY OFFICER/ALTERNATE

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.

ADRIANNA BOSCO

SENIOR PROFESSIONAL

Adrianna Bosco is a Senior Professional in AKRF's Site Assessment and Remediation Department. She has experience in navigating redevelopment projects through regulatory requirements under local and state programs. Ms. Bosco has worked closely with projects enrolled in the NYSDEC Brownfield Cleanup Program, the New York City Voluntary Cleanup Program (VCP), and NYSDEC petroleum spills program, from initial stages of investigation and remediation, through site closure and post-remedial management. Ms. Bosco also has experience in preparing Phase I Environmental Site Assessments and Subsurface (Phase II) Investigations, in addition to conducting environmental/construction oversight and the associated reporting elements. Prior to joining AKRF, she worked as an Environmental Scientist for PS&S Engineering, Inc.

BACKGROUND

Education

B.S., Environmental Engineering, Manhattan College, Bronx, New York, 2011

Licenses/Certifications

40 Hour OSHA HAZWOPER Certified, September 2011
10 Hour OSHA Construction Program Certified, October 2013

Years of Experience

Date started at AKRF: July 2014
Prior industry experience: PS&S Engineering, Inc. December 2011 – July 2014 (2 years, 7 months)

RELEVANT EXPERIENCE – AKRF

147-25 94th Avenue, Queens, NY

This historical meat refrigeration facility is enrolled in the Brownfield Cleanup Program to remediate the property and construct a 23-story affordable residential building. Although the site has an E-Designation for hazardous materials, noise, and air quality, AKRF assisted with applying for entry into the NYSDEC Brownfield Cleanup Program, due to the presence of contaminated soil and soil vapor beneath the site. AKRF is providing environmental consulting services throughout the project. As the Deputy Project Manager, Ms. Bosco prepared the Brownfield Cleanup Program application and Remedial Work Plan. Ms. Bosco also managed field activities associated with the Remedial Investigation, to determine the vertical and horizontal extent of on-site contamination. Once construction begins, Ms. Bosco will also manage the on-site remediation and prepare NYSDEC-required submittals and reports.

1888 Bathgate Avenue Redevelopment Site, Bronx, NY

AKRF is providing environmental consulting services in connection to the investigation and remediation of an approximately 36,000-square foot parcel enrolled in the Brownfield Cleanup Program. This former steel door manufacturing facility is contaminated with chlorinated solvents, including tetrachloroethene. The selected remedy included site-wide excavation of soil and bedrock, continuous air monitoring, collection of post-excavation endpoint samples, and implementation of an in-situ groundwater treatment program. As the Deputy Project Manager for this project, Ms. Bosco is managing various field efforts, including a Remedial Design Investigation to develop the groundwater treatment program and implementation of the Remedial Action Work Plan. Upon completion of the remediation, Ms. Bosco will prepare the Final Engineering Report and Site Management Plan for submission to the NYSDEC.

East Side Coastal Resiliency, Manhattan, NY

Ms. Bosco served as an Environmental Scientist and conducted a portion of the 2016 subsurface investigation of the 2.5 mile study area from Montgomery Street to East 23rd Street. The ESCR subsurface exploration program involved a review of available utility plans and environmental reports involving manufactured gas plant (MGP) and petroleum-related contamination. Responsibilities included groundwater sampling, soil boring and temporary well installation, and compliance with the Supplemental Subsurface Investigation Work Plan.

Elton Crossing, Bronx, NY

AKRF's work includes the implementation of the NYSDEC-approved Remedial Action Work Plan for this former industrial property, including: in-situ testing, off-site transport, the closure of two petroleum spills; the registration, removal, and closure of five petroleum storage tanks encountered during excavation; and the delineation of soil contaminants, including hazardous lead, petroleum, and pesticides. As the Environmental Scientist, Ms. Bosco provided remedial oversight during soil excavation, confirmatory endpoint sampling, SSDS piping installation and inspections, vapor barrier installation, and air monitoring for particulates and volatile organic compounds (VOCs).

145 West Street, Greenpoint, Brooklyn, NY

As the Environmental Scientist and Deputy Project Manager for this project, Ms. Bosco conducted a supplemental remedial investigation, including soil and groundwater sampling, and several rounds of waste characterization soil sampling. Ms. Bosco also performed remedial oversight during activities such as soil excavation and off-site disposal, underground storage tank (UST) removal, SSDS piping installation and testing, and routine air monitoring. Ms. Bosco also aided in the preparation of the Final Engineering Report (FER) and Site Management Plan (SMP).

Former Laundry/Dry Cleaning Plant, New York, NY

Ms. Bosco served as the Environmental Scientist of the only New York State Department of Environmental Conservation's (NYSDEC) listed inactive hazardous waste (State Superfund) site in Manhattan, a former laundry/dry cleaning plant in Harlem. Remedial investigation included evaluation of soil, groundwater, soil vapor, indoor air, and building materials. Interim remediation included the removal of contaminated building materials and operation of an innovative sub-slab vapor extraction system retrofitted into the existing building. As the Environmental Scientist, Ms. Bosco performed remedial action oversight, including SSDS piping installation inspections and Health and Safety Plan (HASP) air monitoring for volatiles and particulates. Remedial action work was completed in 2014 and documented in a Final Engineering Report. NYSDEC issued Certificate of Completion in January 2015 and the site has been reclassified to a "Class 4" site (site properly closed – requires continued management). Ongoing activities continue under the NYSDEC-approved Site Management Plan, including operations, maintenance and monitoring of the SSDS and SVE system.

RELEVANT EXPERIENCE – OTHER

PS&S Engineering, Inc. (PS&S), Yonkers, NY

Before joining AKRF, Ms. Bosco was an Environmental Scientist in the Environmental Department at PS&S. She was responsible for conducting site investigations and providing construction oversight for remediation projects in New York and New Jersey. As a staff scientist, she was responsible for sampling and analysis of various media, preparing technical reports and work plans, and conducting Phase I Environmental Site Assessments.

ANTONIO CARDENAS

ENVIRONMENTAL SCIENTIST

Mr. Cardenas is an Environmental Scientist in the AKRF, Inc. Site Assessment and Remediation Group. His experience includes Phase I Environmental Site Assessments, soil, groundwater, and soil gas sampling, and environmental monitoring of construction sites.

BACKGROUND

Education

B.S., Geology, City College of the City University of New York, NY, 2017

Certifications

OSHA 40-hour Health & Safety Training for Hazardous Waste Operations

OSHA 10-hour Health & Safety Training for Hazardous Waste Operations

USEPA Air Monitoring for Emergency Response Training Program, AMFER Certificate

Years of experience

Year started in company: 2018

Year started in the industry: 2018

RELEVANT EXPERIENCE – AKRF

85 Jay Street, Brooklyn, NY – NYS Brownfield Redevelopment

Remediation of a former lead smelter is being conducted under the New York State Brownfield Cleanup Program (BCP). AKRF completed a Phase II Subsurface Investigation, Remedial Investigation, and prepared a Remedial Action Work Plan (RAWP) to address subsurface contamination during site redevelopment including in-situ stabilization of lead impacted soil. For this project, Mr. Cardenas served as an on-site environmental monitor who conducted work zone and community air monitoring, and oversaw excavation and export of soil. Additionally, Mr. Cardenas collected confirmatory soil samples at the bottom of excavation and throughout soil stabilization. The project is in the midst of remediation, and Mr. Cardenas assists in overseeing the soil conditioning program, the excavation monitoring (CAMP and CHASP), and the daily reporting obligation to NYSDEC. The project anticipates a 12-month construction period and is projected to achieve a Track 1 cleanup in 2019.

Rego Park Home Depot, Queens, NY

Solvent contamination was encountered during retail development of a former industrial property in Rego Park, Queens, New York. The site work included an extensive investigation and a multi-phase remediation performed under the NYSDEC Voluntary Cleanup Program (VCP). Remediation included removal of aboveground and underground storage tanks (ASTs and USTs) and hotspot soil removal. An Air Sparging/Soil Vapor Extraction (AS/SVE) groundwater remediation system designed by AKRF was installed as part of the building construction. Continued remediation work included upgrading and expanding the AS/SVE system after the store was opened. AKRF continues operations, maintenance, and monitoring under the NYSDEC-approved Site Management Plan. Mr. Cardenas performed low flow sampling as part this process.

Manhattan West, Manhattan, NY

AKRF is providing environmental consulting services to Brookfield Office Properties in connection with the Manhattan West development site, which encompasses an entire city-block above the Amtrak approach to Penn Station. The four towers that comprise the Manhattan west development site are being remediated as four different sites under the New York City Office of Environmental Remediation (NYCOER), due to an E-Designation for hazardous materials, air quality, and noise attenuation. Mr. Cardenas provided environmental oversight.

34 Berry Street, Brooklyn, NY

AKRF was retained to prepare close-out documentation for this former industrial/warehouse facility in Williamsburg, which was remediated under the NYCOER E-designation and NYSDEC Spills programs. The closure report, which was based on documentation provided by the environmental contractor, was prepared on an expedited basis so that the developer could obtain a Certificate of Occupancy in time for the scheduled opening of the new building. AKRF is currently providing on-going remediation monitoring services to fulfill NYSDEC Spill closure requirements. For this project, Mr. Cardenas performed soil sampling.

Queens Animal Shelter Site, Queens, NY

The Queens Animal Shelter Site is currently an automobile wrecking facility. AKRF is assisting the Client in taking the Site into the BCP to investigate and remediate the property as part of redevelopment into a new state-of-the-art animal shelter and care facility. For this project, Mr. Cardenas performed low flow sampling for laboratory analyses as part of the Remedial Investigation at the Site.

RELEVANT EXPERIENCE – OTHER

Interior Management Inc. (2011-2013)

Before joining AKRF, Mr. Cardenas worked in the maintenance department of Interior Management Inc. He learned how to manage a work site, detect and report leaks, identify building damages, and foster a positive work environment for employees.

TIMOTHY G. LARIGAN

PROFESSIONAL II

Timothy G. Larigan is an environmental scientist with 5 years of experience in environmental remediation/compliance, Phase I/Phase II Environmental Assessments; project management; technical reporting; data analysis; field sampling; contractor oversight; wetlands delineation and permitting. He has directed environmental remediation, due diligence, asbestos, and wetlands projects and completed them within the proposed timeframe and budget. Mr. Larigan has also managed client and regulatory agency interactions. He has performed various field activities such as soil, groundwater, and vapor sampling and wetlands delineation. He has a working knowledge of GIS software and SAS statistical software.

BACKGROUND

Education
BS, Stockton University, Environmental Science, 2015

Licenses/Certifications
Regulatory Training in Underground Storage Tanks Certificate
Wetlands Delineation Certificate
OSHA 40 Hour HAZWOPER
OSHA 30 Hour Construction

Years of Experience
5 years in the industry
<1 year with AKRF

RELEVANT EXPERIENCE

J2 147-07 94th Avenue LLC, Alvista Towers, Queens, NY

Environmental Scientist. This historical meat refrigeration facility is enrolled in the Brownfield Cleanup Program to remediate the property and construct a 23-story affordable residential building. Although the site has an E-Designation for hazardous materials, noise, and air quality, AKRF assisted with applying for entry into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program, due to the presence of contaminated soil and soil vapor beneath the site. AKRF is providing environmental consulting services throughout the project. Mr. Larigan is responsible for performing a Phase I Environmental Site Assessment (ESA) and preparing a Phase I ESA Report.

Site 9 DSA Owner LLC, Essex Crossing Site 9, New York, NY

Environmental Scientist. This approximately 20,300 square foot property has been developed with mixed-use residential and commercial/industrial buildings (e.g. printer shop, machine shop, photo shop) since the late-1800s. The site was later redeveloped as the Essex Street Market, which operated until 2019. Mr. Larigan is responsible for performing a Phase I Environmental Site Assessment (ESA) and preparing a Phase I ESA Report, along with preparing a Phase II Work Plan and Health and Safety Plan (HASP) for a proposed Phase II subsurface investigation. Mr. Larigan is also responsible for performing a limited subsurface investigation, consisting of soil sample collection, for due diligence purposes.

TIMOTHY G. LARIGAN

PROFESSIONAL II

4NYCHousing Inc., 201-207 Seventh Avenue, New York, NY

Environmental Scientist. This historical mixed-use residential and commercial/industrial property was developed in the late-1800s, and has been vacant since 2018. Mr. Larigan is responsible for conducting soil, groundwater, and vapor sample collection as part of a Phase II investigation, along with preparing a subsurface investigation report, documenting the findings of the Phase II investigation.

DLANDstudio Architecture + Landscape Architecture pllc, Stapleton Playground, Staten Island, NY

Environmental Scientist. This public park and historical gasoline filling station has been closed to the public and undergoing renovations since 2019. During excavation for park improvements, petroleum-contaminated soil was discovered and spill was reported to the New York State Department of Environmental Conservation (NYSDEC). Mr. Larigan is responsible for overseeing the installation of groundwater monitoring wells, performing quarterly groundwater monitoring/sampling events, and preparing quarterly groundwater evaluation reports as part of an environmental investigation at the site related to the spill.

PREVIOUS EXPERIENCE

Atlantic Environmental Solutions, Inc., Hoboken, NJ
Project Manager/Senior Environmental Scientist
While at another firm, Mr. Larigan was responsible for the following:

- Managed site remediation projects, underground storage tank removal projects, and Phase I/Phase II environment assessments
- Directed asbestos surveys, mold assessments, and wetlands delineation/permitting projects
- Prepared proposals, bids, and work authorizations for environmental services with detailed scopes of work, schedules, and cost estimates
- Performed technical review, data analysis, and problem solving for site remediation projects and managed client and regulatory agency interactions

Brinkerhoff Environmental Services, Inc., Manasquan, NJ
Environmental Scientist
While at another firm, Mr. Larigan was responsible for the following:

- Performed soil, groundwater, and vapor sampling in accordance with State technical requirements;
- Prepared environmental reports, including Phase I/Phase II ESAs, Remedial Investigation and Remedial Action reports, and environmental permit applications in accordance with State requirements;
- Directed and oversaw in-situ chemical oxidation (ISCO) treatments, and installation of sub-slab vapor mitigation systems and other presumptive remedies/engineering controls in accordance with State technical requirements
- Performed geophysical surveys utilizing Ground Penetrating Radar (GPR) and Electromagnetic technology.

APPENDIX B

HEALTH AND SAFETY PLAN

MAPES EAST 182 STREET

BRONX, NEW YORK

Health and Safety Plan & Community Air Monitoring Plan

NYSDEC BCP Site No: C203149
AKRF Project Number: 210138

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:

East 182 Street Associates, LLC
902 Broadway, 13th Floor
New York, NY 10010

Prepared by:

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

DECEMBER 2021

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Attachment B – Report Forms
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Attachment D – Special Requirements for COVID-19

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) by AKRF, Inc. (AKRF) personnel and its subcontractors at the Mapes East 182 Street site located at 820 East 182nd Street in the Belmont section of the Bronx, New York, hereafter referred to as the "Site." The Site is identified by the City of New York as Borough of Queens, Block 3111, Lot 59.

Currently, the Site is developed with a former Sunoco® gasoline station and a single-story building that formerly housed an auto repair shop and adjoining convenience store. A decommissioned pump island, located in the eastern portion of the lot, was supplied by five 4,000-gallon gasoline underground storage tanks (USTs) located beneath the northern portion of the Site. In addition, an empty 1,000-gallon waste oil UST is located in the northwestern portion of the Site, abutting the auto repair shop. The pump island was disconnected in May 2021 and the USTs were emptied and taken out-of-service in October 2021. The exterior surface of the Site is asphalt-paved with surficial cracking and petroleum-like staining noted throughout, including around the pump island. The Site is abutted to the north by East 182nd Street, followed by a multi-story apartment building; to the south by multi-story apartment buildings; to the east by the intersection of Southern Boulevard, East 182nd Street, and Crotona Parkway, followed by the Bronx Zoo; and to the west by a multi-tenant commercial building consisting of a deli/grocery, restaurant, and beauty spa. The surrounding area comprises predominantly residential and commercial uses. A Site Location Map is provided as Figure 1

A Phase II Environmental Site Assessment (ESA) was conducted by AKRF in March 2021 and documented in a Phase II ESA Report dated May 2021. The previous investigation identified elevated levels of petroleum-related volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and select metals in soil, and petroleum-related VOCs in soil vapor. Groundwater was not encountered above bedrock.

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 the AKRF's Generic HASP and all Occupation Safety and Health Administration (OSHA)-applicable regulations for the work activities required for the project. This HASP also includes supplemental requirements to minimize potential exposure related to COVID-19 (see Attachment D). 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

Hazards of concern include: organic and inorganic chemicals, and heat and/or cold stress.

2.1.2 Physical Characteristics

Physical characteristics of the hazards of concern include solid, aqueous, and vapor states.

2.1.3 Hazardous Materials

The Site-specific hazardous materials that may be encountered during RI implementation include: historical fill material, solvent-related VOCs, SVOCs, petroleum, polychlorinated biphenyls (PCBs), and/or metals.

2.1.4 Chemicals of Concern

Chemical	REL/PEL/STEL	Health Hazards
Benzene	REL: 0.1 ppm N STEL: 1 ppm PEL: 1 ppm O STEL: 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen].
Chromium	REL: 0.5 mg/m^3 PEL: 1 mg/m^3	Irritation eyes, skin; lung fibrosis (histologic).
Copper	REL: 1 mg/m^3 PEL: 1 mg/m^3	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia.
DDD, DDE, & DDT	REL: 0.5 mg/m^3 PEL: 1 mg/m^3	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 occupational carcinogen].
Ethylbenzene	REL: 100 ppm N STEL: 125 ppm PEL: 100 ppm	Irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects.
Fuel Oils	REL: 100 mg/m^3	Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid).

Chemical	REL/PEL/STEL	Health Hazards
Lead	REL: 0.050 mg/m^3 PEL:0.050 mg/m^3	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension.
Mercury	REL: 0.05 mg/m^3 REL C: 0.1 mg/m^3 PEL: 0.1 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.
Methylene Chloride	PEL: 25 ppm O STEL: 125 ppm	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen].
PAHs	REL: 0.1 mg/m^3 PEL: 0.2 mg/m^3	Effects reported from occupational exposure to PAHs include chronic bronchitis, chronic cough irritation, bronchogenic cancer, dermatitis, cutaneous photosensitization, and pilosebaceous reactions. Reported health effects associated with chronic exposure to coal tar and its by-products (e.g., PAHs): Skin: erythema, burns, and warts on sun-exposed areas with progression to cancer. The toxic effects of coal tar are enhanced by exposure to ultraviolet light. Eyes: irritation and photosensitivity. Respiratory system: cough, bronchitis, and bronchogenic cancer. Gastrointestinal system: leukoplakia, buccal-pharyngeal cancer, and cancer of the lip. Hematopoietic system: leukemia (inconclusive) and lymphoma. Genitourinary system: hematuria and kidney and bladder cancers.
PCBs	REL: 0.001 mg/m^3 PEL: 0.5 mg/m^3	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen].
Tetrachloroethylene	PEL: 100 ppm PEL C: 200 ppm; max peak: 300 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen].
Toluene	REL: 100 ppm N STEL: 150 ppm PEL: 200 ppm PEL C: 300 ppm; 10-min max peak: 500 ppm	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Trichloroethylene	PEL: 100 ppm PEL C: 200 ppm; 5-min max peak: 300 ppm	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen].

Chemical	**REL/PEL/STEL**	**Health Hazards**
Xylene	REL: 100 ppm N STEL: 150 ppm PEL: 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Zinc	REL: 5 mg/m^3 REL C: 15 mg/m^3 N STEL: 10 mg/m^3 PEL: 5 mg/m^3 (ZnO fume); 15 mg/m^3 (ZnO dust)	Chills, elevated body temperature, myalgia, cough, fatigue, chest pain, stomach cramps, nausea, anemia, changes in cholesterol levels, and vomiting.
Notes: REL: Recommended exposure limit (NIOSH) PEL: Permissable exposure limits (OSHA) STEL: Short-term exposure limit N: NIOSH O: OSHA C: Ceiling		

The potential health effects from these known and suspected on-site contaminants are provided in Attachment A.

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 work under the direction of a Qualified Environmental Professional (QEP) and will be experienced in the implementation of air monitoring and hazardous materials sampling programs. Health and safety training required for the SSO and all field personnel are 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 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 work. 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 any contamination, ensure that proper PPE 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 is the zone area where support facilities such as vehicles, 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. The exclusion zone and CRZ are 10 and 25 feet from the drill rig during the RI, respectively. Control measures such as caution tape and/or traffic cones will be placed around the perimeter of the work area when needed.

2.6 Work Zone Air Monitoring

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. Field personnel will be trained in the proper operation of all field instruments at the start of the field program. 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 will be contacted immediately to obtain a replacement instrument and arrange for repairs.

2.6.1 Volatile Organic Compound (VOC) Monitoring

Continuous monitoring for VOCs will be conducted using roving hand-held equipment 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 will also be recorded.

2.6.2 Airborne Particulate Monitoring

A DustTrak® or equivalent would be used to measure real-time concentrations of total particulates 10 micrometers or less (PM_{10}). Measurements for particulates will be taken prior to commencement of the work and during the work in areas where contaminated soil would be disturbed. The action levels listed in Table 1 are based on 15-minute averages of the monitoring data. The measurements will be made at the breathing height of the workers and as close to their location as practicable. The Site Safety Officer (SSO) will set up the equipment and confirm that it is working properly. His/her qualified designee may oversee the air measurements during the day. The initial measurement for the day will be performed before the start of work and will establish background levels. The final measurement for the day will be performed after the end of work. The action levels for particulates and VOCs and required responses are listed in Table 1.

Table 1
Work Zone Action Levels and Required Responses

Monitoring	Action Level[1]	Response Action
Particulate	Less than 0.125 mg/m^3 above background	**Level D or D-Modified** (Requires coveralls and steel toe boots) (As applicable: Chemical resistant gloves, chemical resistant boot covers, hard hat, safety glasses, face shield, or escape mask)
	Between 0.125 mg/m^3 and 0.150 mg/m^3 above background	**Level C** (Requires full face or half face respirator, hooded chemical resistant two piece Tyvek suit or overalls, chemical resistant inner and outer gloves, chemical resistant boot covers, steel toe and shank boots) (As applicable: hard hat, face shield, or escape mask) Apply dust suppression measures. Resume work or upgrade.
	Greater than 0.150 mg/m^3 above background	Stop work. Apply additional dust suppression measures. Resume work when less than 0.150 mg/m^3 and maintain Level C.
Volatile Organic Compound (VOC)	Less than 5 ppm in breathing zone	**Level D or D-Modified**
	Between 5 and 50 ppm	**Level C**
	More than 50 ppm	Stop work. Resume work when source of vapors is abated and readings are less than 50 ppm above background.

Notes:
[1] - 15-minute time-weighted average
parts per million = ppm
milligrams per cubic meter = mg/m^3

2.6.3 Major Vapor Emission Response Plan

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work 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:

- The 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 Site Health and Safety Officer; and
- All Emergency contacts will go into effect as appropriate.
- All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review.

2.7 Personal Protection Equipment (PPE)

The PPE required for various kinds of 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 PPE. The protection will be based on the air monitoring described in Section 2.6.

Level D PPE includes donning of the following during drilling and sampling:

- Steel Toed Boots
- Hard Hat
- Work Gloves
- Safety Glasses
- Ear Plugs
- Nitrile Gloves
- Tyvek Suit [if non-aqueous phase liquid (NAPL) is present]

If PID readings exceed 5 ppm in the breathing zone, personnel will don Level C PPE, which includes Level D PPE and a half- or full-face respirator with a dual organic and particulate cartridge.

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 Location Map showing the more direct route to the hospital is included as Figure 2.

3.1 Hospital Information

Hospital Name:	St. Barnabas Hospital
Phone Number:	(718) 960-9000
Address:	4422 3rd Avenue, Bronx, NY 10457
Directions:	1. Turn LEFT out of the Site onto East 182nd Street toward Mapes Avenue. 2. Turn LEFT onto Quarry Road. 3. Turn RIGHT onto East 181st Street. 4. Turn RIGHT onto 3rd Avenue. The emergency room will be on the RIGHT at the intersection of 3rd Avenue and East 183rd Street.

3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Deborah Shapiro	Project Director, QEP	(646) 388-9544
	Adrianna Bosco	Project Manager	(646) 388-9576
	Tim Larigan	Field Team Leader/Site Safety Officer (SSO)	(862) 368-8791 (cell)
	Antonio Cardenas	Alternate Field Team Leader/SSO	(718) 551-7193 (cell)
East 182 Street Associates, LLC	Matthew Kelly	Applicant's Representative	(212) 243-9090
Ambulance, Fire Department & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	800-457-7362

4.0 APPROVAL & ACKNOWLEDGMENTS OF HASP

4.1 Approval

Signed: ____________________________ Date: ____________________________

AKRF Project Manager

Signed: ____________________________ Date: ____________________________

AKRF Health and Safety Officer

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.

4.2 Affidavit

I have read the Health and Safety Plan (HASP) for the project located at the Mapes East 182 Street site located at 820 East 182nd Street 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: __________

Signed: ______________________ Company: ____________________ Date: __________

Signed: ______________________ Company: ____________________ Date: __________

Signed: ______________________ Company: ____________________ Date: __________

Signed: ______________________ Company: ____________________ Date: __________

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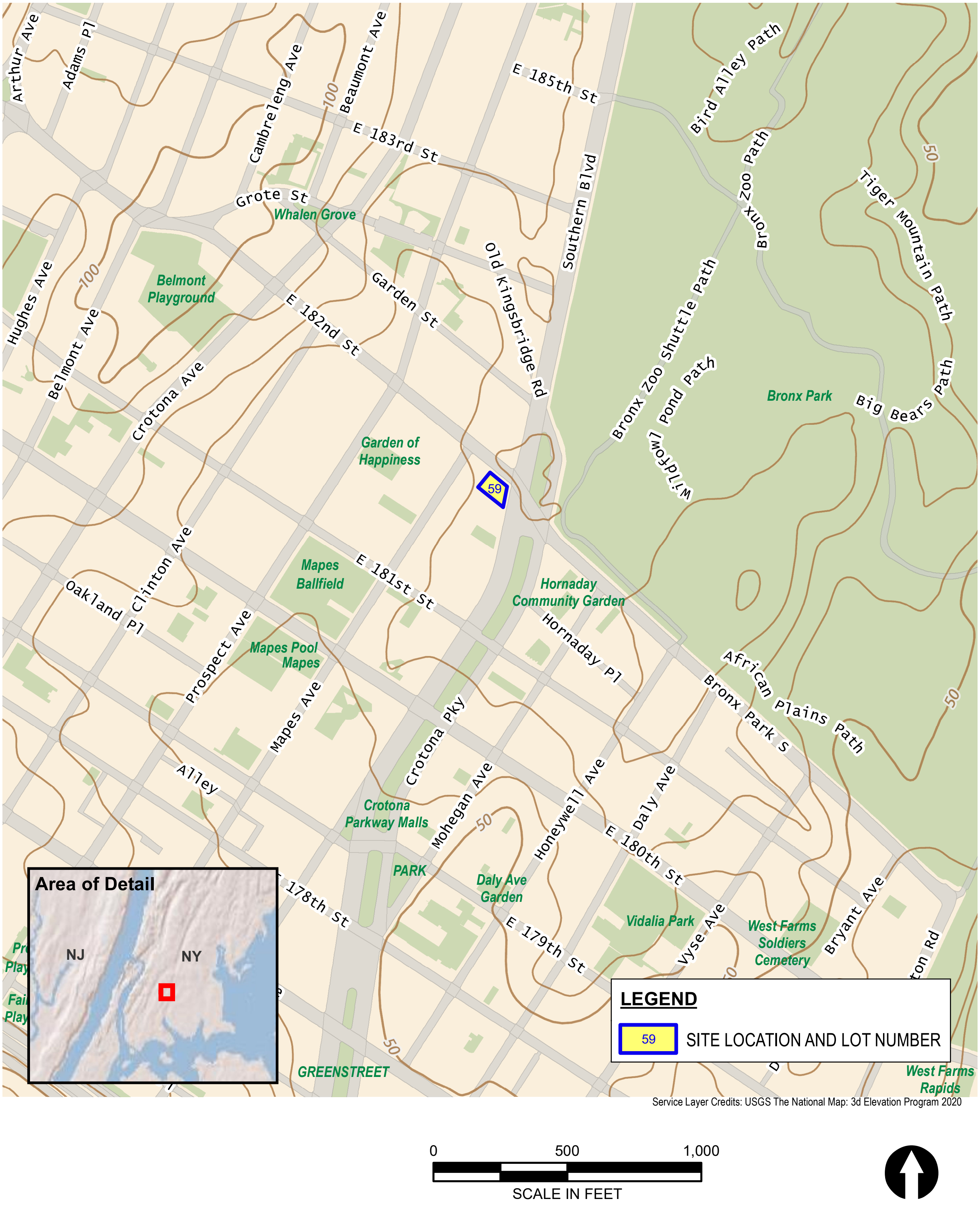
Signed: ______________________ Company: ____________________ Date: __________

FIGURES



Service Layer Credits: USGS The National Map: 3d Elevation Program 2020

AKRF

440 Park Avenue South, New York, NY 10016

820 East 182nd Street

Bronx, New York

SITE LOCATION

DATE

7/13/2021

PROJECT NO.

210138

FIGURE

1

Service Layer Credits: ESRI World Street Map 2021

St. Barnabas Hospital
4422 3rd Avenue
Bronx, NY 10457
(718) 960-9000

LEGEND

🟨 PROJECT SITE BOUNDARY

⊕ HOSPITAL LOCATION

← ROUTE TO HOSPITAL

0 500 1,000
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

820 East 182nd Street
Bronx, New York

HOSPITAL ROUTE MAP

DATE
12/3/2021

PROJECT NO.
210138

FIGURE
1

ATTACHMENT A

POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

BENZENE

CAS # 71-43-2

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

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

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 813 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is benzene?

(Pronounced bĕn′zēn′)

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

☐ Industrial processes are the main source of benzene in the environment.

☐ Benzene can pass into the air from water and soil.

☐ It reacts with other chemicals in the air and breaks down within a few days.

☐ Benzene in the air can attach to rain or snow and be carried back down to the ground.

☐ It breaks down more slowly in water and soil, and can pass through the soil into underground water.

☐ Benzene does not build up in plants or animals.

How might I be exposed to benzene?

☐ Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.

☐ Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.

☐ Air around hazardous waste sites or gas stations will contain higher levels of benzene.

☐ Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.

☐ People working in industries that make or use benzene may be exposed to the highest levels of it.

☐ A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

The major effect of benzene from long-term (365 days or longer) exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.

Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How likely is benzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

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

Several tests can show if you have been exposed to benzene. There is test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood, however, since benzene disappears rapidly from the blood, measurements are accurate only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 0.005 milligrams per liter (0.005 mgL). The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 1 part of benzene per million parts of air (1 ppm) in the workplace during an 8-hour workday, 40-hour workweek.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Chromosomes: Parts of the cells responsible for the development of hereditary characteristics.

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Benzene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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CHROMIUM

CAS # 7440-47-3

Division of Toxicology and Environmental Medicine ToxFAQs™ **September 2008**

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

HIGHLIGHTS: Exposure to 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 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 to chromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Reseach 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 risks 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 determined that exposure to chromium 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 FDA has determined that the chromium concentration in bottled drinking water should not exceed 1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.0005 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). 2008. Toxicological Profile for Chromium (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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COPPER

CAS # 7440-50-8

Division of Toxicology ToxFAQs™ September 2002

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 reddish metal that occurs naturally in the environment. It also occurs naturally 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 crumps, and nausea. Copper has been found in at least 884 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is copper?

Copper is a reddish metal that occurs naturally in rocks, soil, water, and air. Copper also occurs naturally in plants and animals.

Metallic copper can be easily molded or shaped. Metallic copper can be found in the U.S. penny, electrical wiring, and some water pipes. Metallic copper is also found in mixtures (called alloys) with other metals such as brass and bronze. Copper is also found as part of other compounds forming salts. Copper salts occur naturally, but are also manufactured. The most common copper salt is copper sulfate. Most copper compounds are blue-green in color. 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 can enter the environment from the mining of copper and other metals and from factories that make or use metallic copper or copper compounds.
☐ It can also enter the environment through domestic waste water, combustion of fossil fuels and wastes, wood production, phosphate fertilizer production, and natural sources (e.g., windblown dust from soils, volcanoes, decaying vegetation, forest fires, and sea spray).
☐ Copper in soil strongly attaches to organic material and minerals.
☐ Copper that dissolves in water becomes rapidly bound to particles suspended in the water.
☐ Copper does not typically enter groundwater.
☐ Copper carried by particles emitted from smelters and ore processing plants is carried back to the ground by gravity or in rain or snow.
☐ Copper does not break down in the environment.

How might I be exposed to copper?

☐ Breathing air, drinking water, eating food, and by skin contact with soil, water, or other copper-containing substances.
☐ Some copper in the environment can be taken up by plants and animals.
☐ Higher exposure may occur if your water is corrosive and you have copper plumbing and brass water fixtures. ☐ You may be exposed to higher amounts of copper if you drink water or swim in lakes or reservoirs recently treated with copper to control algae or receive cooling water from a power plant that may have high amounts of dissolved copper.
☐ Using some garden products (e.g., fungicides) to control plant diseases.
☐ Living near bronze and brass production facilities may expose you to higher copper levels in soil.
☐ You may breathe copper-containing dust or have skin contact if you work in the industry of mining copper or

processing the ore. You may breathe high levels if you grind or weld copper metal.

How can copper affect my health?

Copper is essential for good health, but high amounts can be harmful. Long-term exposure to copper dust can irritate your nose, mouth, and eyes, and cause headaches, dizziness, nausea, and diarrhea.

Drinking water with higher than normal levels of copper may cause vomiting, diarrhea, stomach cramps, and nausea. Intentionally high intakes of copper can cause liver and kidney damage and even death.

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 carcinogenicity.

How can copper affect children?

Exposure to high levels of copper will result in the same type of effects in children and adults. Studies in animals suggest that the young children may have more severe effects than adults; we do not 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 ingestion of high levels of copper may cause a decrease in fetal growth.

How can families reduce the risk of exposure to copper?

☐ The greatest potential source of copper exposure is through drinking water, especially in water that is first drawn in the morning after sitting in copper pipes and brass faucets overnight.

☐ To reduce exposure, run the water for at least 15-30 seconds before using it.

☐ If you are exposed to copper at work, you may carry copper home on your skin, clothes, or tools. You can avoid this by showering, and changing 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 copper?

Copper is normally found in all tissues of the body, blood, urine, feces, hair, and nails. High levels of copper in these samples can show that you have been exposed to higher than normal levels of copper. Tests to measure copper levels in the body are not routinely available at the doctor's office because they require special equipment. These tests cannot tell the extent of exposure or whether you will experience harmful effects.

Has the federal government made recommendations to protect human health?

The EPA has determined that drinking water should not contain more than 1.3 milligrams of copper per liter of water (1.3 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 mg per cubic meter (0.1 mg/m^3) of copper fumes (vapor generated from heating copper) and 1 mg/m^3 of copper dusts (fine metallic copper particles) and mists (aerosol of soluble copper) in workroom air during an 8-hour work shift, 40-hour workweek.

The Food and Nutrition Board of the Institute of Medicine recommends dietary allowances (RDAs) of 340 micrograms (340 µg) of copper per day for children aged 1-3 years, 440 µg/day for children aged 4-8 years, 700 µg/day for children aged 9-13 years, 890 µg/day for children aged 14-18 years, and 900 µg/day for adults.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Copper (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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

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ETHYLBENZENE

CAS # 100-41-4

Agency for Toxic Substances and Disease Registry ToxFAQs **June 1999**

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

HIGHLIGHTS: Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is ethylbenzene?

(Pronounced ĕth′ əl bĕn′ zēn′)

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

What happens to ethylbenzene when it enters the environment?

☐ Ethylbenzene moves easily into the air from water and soil.

☐ It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.

☐ Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.

☐ In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.

☐ In soil, it is broken down by soil bacteria.

How might I be exposed to ethylbenzene?

☐ Breathing air containing ethylbenzene, particularly in areas near factories or highways.

☐ Drinking contaminated tap water.

☐ Working in an industry where ethylbenzene is used or made.

☐ Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classifiable as to human carcinogenicity.

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No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

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

Ethylbenzene is found in the blood, urine, breath, and some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

References

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

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

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FUEL OILS

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

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

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

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

What are fuel oils?

(Pronounced fyo͞o′əl oilz)

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

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

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

What happens to fuel oils when they enter the environment?

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

How might I be exposed to fuel oils?

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

How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene

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stoves for cooking do not seem to have any health problems related to their exposure.

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

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

How likely are fuel oils to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

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

References

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

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LEAD

CAS # 7439-92-1

Division of Toxicology and Environmental Medicine ToxFAQs™ **August 2007**

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

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

What is lead?

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

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

What happens to lead when it enters the environment?

❏ Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.

❏ When lead is released to the air, it may travel long distances before settling to the ground.

❏ Once lead falls onto soil, it usually sticks to soil particles.

❏ Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

❏ Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.

❏ Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.

❏ Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.

❏ Using health-care products or folk remedies that contain lead.

How can lead affect my health?

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

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

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

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

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

How can families reduce the risks of exposure to lead?

☐ Avoid exposure to sources of lead.

☐ Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.

☐ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.

☐ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children

☐ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

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

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

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 μg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 μg per liter.

References

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

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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MERCURY

CAS # 7439-97-6

Agency for Toxic Substances and Disease Registry ToxFAQs April 1999

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

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

What is mercury?

(Pronounced mũ̄r′kyə-rē)

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

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

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

What happens to mercury when it enters the environment?

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

How might I be exposed to mercury?

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

How can mercury affect my health?

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

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

How likely is mercury to cause cancer?

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

How can mercury affect children?

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

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

How can families reduce the risk of exposure to mercury?

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

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

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

References

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

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

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METHYLENE CHLORIDE

CAS # 75-09-2

Division of Toxicology ToxFAQs™ **February 2001**

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

HIGHLIGHTS: Exposure to methylene chloride occurs mostly from breathing contaminated air, but may also occur through skin contact or by drinking contaminated water. Breathing in large amounts of methylene chloride can damage the central nervous system. Contact of eyes or skin with methylene chloride can result in burns. Methylene chloride has been found in at least 882 of 1,569 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is methylene chloride?

Methylene chloride is a colorless liquid with a mild, sweet odor. Another name for it is dichloromethane. Methylene chloride does not occur naturally in the environment.

Methylene chloride is used as an industrial solvent and as a paint stripper. It may also be found in some aerosol and pesticide products and is used in the manufacture of photographic film.

What happens to methylene chloride when it enters the environment?

❏ Methylene chloride is mainly released to the environment in air. About half of the methylene chloride in air disappears in 53 to 127 days.

❏ Methylene chloride does not easily dissolve in water, but small amounts may be found in drinking water.

❏ We do not expect methylene chloride to build up in plants or animals.

How might I be exposed to methylene chloride?

❏ The most likely way to be exposed to methylene chloride is by breathing contaminated air.

❏ Breathing the vapors given off by products containing methylene chloride. Exposure to high levels of methylene chloride is likely if methylene chloride or a product containing it is used in a room with inadequate ventilation.

How can methylene chloride affect my health?

If you breathe in large amounts of methylene chloride you may feel unsteady, dizzy, and have nausea and a tingling or numbness of your finger and toes. A person breathing smaller amounts of methylene chloride may become less attentive and less accurate in tasks requiring hand-eye coordination. Skin contact with methylene chloride causes burning and redness of the skin.

How likely is methylene chloride to cause cancer?

We do not know if methylene chloride can cause cancer in humans. An increased cancer risk was seen in mice breathing large amounts of methylene chloride for a long time.

The World Health Organization (WHO) has determined that methylene chloride may cause cancer in humans.

The Department of Health and Human Services (DHHS) has determined that methylene chloride can be reasonably anticipated to be a cancer-causing chemical.

The EPA has determined that methylene chloride is a probable cancer-causing agent in humans.

How can methylene chloride affect children?

It is likely that health effects seen in children exposed to high amounts of methylene chloride will be similar to the effects seen in adults. We do not know if methylene chloride can affect the ability of people to have children or if it causes birth defects. Some birth defects have been seen in animals inhaling very high levels of methylene chloride.

How can families reduce the risk of exposure to methylene chloride?

❑ Families may be exposed to methylene chloride while using products such as paint removers. Such products should always be used in well-ventilated areas and skin contact should be avoided.
❑ Children should not be allowed to remain near indoor paint removal activities.

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

❑ Several tests can measure exposure to methylene chloride. These tests are not routinely available in your doctor's office.
❑ Methylene chloride can be detected in the air you breathe out and in your blood. These tests are only useful for detecting exposures that have occurred within a few days.
❑ It is also possible to measure carboxyhemoglobin (a chemical formed in the blood as methylene chloride breaks down in the body) in the blood or formic acid (a breakdown product of methylene chloride) in the urine. These tests are not specific for methylene chloride.

Has the federal government made recommendations to protect human health?

❑ The EPA requires that releases of methylene chloride of 1,000 pounds or more be reported to the federal government.
❑ The EPA recommends that exposure of children to methylene chloride be limited to less than 10 milligrams per liter of drinking water (10 mg/L) for 1 day or 2 mg/L for 10 days.
❑ The Food and Drug Administration (FDA) has established limits on the amounts of methylene chloride that can remain after processing of spices, hops extract, and decaffeinated coffee.
❑ The Occupational Safety and Health Administration (OSHA) has set limits of 25 parts methylene chloride per million parts of workplace air (25 ppm) for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for methylene chloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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

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POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

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

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

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- ☐ PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- ☐ PAHs can occur in air attached to dust particles.
- ☐ Some PAH particles can readily evaporate into the air from soil or surface waters.
- ☐ PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- ☐ PAHs enter water through discharges from industrial and wastewater treatment plants.
- ☐ Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- ☐ Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- ☐ In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- ☐ PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- ☐ Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- ☐ Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- ☐ Coming in contact with air, water, or soil near hazardous waste sites.
- ☐ Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- ☐ Drinking contaminated water or cow's milk.

☐ Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

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

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

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

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

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POLYCHLORINATED BIPHENYLS

Division of Toxicology ToxFAQs™ **February 2001**

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

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

What are polychlorinated biphenyls?

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

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

What happens to PCBs when they enter the environment?

❏ PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.

❏ PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.

❏ PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.

❏ PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

❏ Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.

❏ Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.

❏ Breathing air near hazardous waste sites and drinking contaminated well water.

❏ In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

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

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

How likely are PCBs to cause cancer?

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

How can PCBs affect children?

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

How can families reduce the risk of exposure to PCBs?

❏ You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.

❏ Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.

❏ Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.

❏ If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

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

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

Has the federal government made recommendations to protect human health?

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

References

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

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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TRICHLOROETHYLENE

CAS # 79-01-6

Division of Toxicology ToxFAQs™ July 2003

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

HIGHLIGHTS: Trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death. Trichloroethylene has been found in at least 852 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is trichloroethylene?

Trichloroethylene (TCE) is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers.

Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical.

What happens to trichloroethylene when it enters the environment?

❏ Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time.
❏ Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air.
❏ Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time.
❏ Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
❏ Trichloroethylene does not build up significantly in plants and animals.

How might I be exposed to trichloroethylene?

❏ Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid.
❏ Drinking, swimming, or showering in water that has been contaminated with trichloroethylene.
❏ Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site.
❏ Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment.

How can trichloroethylene affect my health?

Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.

Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

Skin contact with trichloroethylene for short periods may cause skin rashes.

How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9th Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is "reasonably anticipated to be a human carcinogen." The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is "probably carcinogenic to humans."

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

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.

The EPA has also developed regulations for the handling and disposal of trichloroethylene.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 100 parts of trichloroethylene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: The ability of a substance to cause cancer.
CAS: Chemical Abstracts Service.
Evaporate: To change into a vapor or gas.
Milligram (mg): One thousandth of a gram.
Nonflammable: Will not burn.
ppm: Parts per million.
Sediment: Mud and debris that have settled to the bottom of a body of water.
Solvent: A chemical that dissolves other substances.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Trichloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

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

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

TETRACHLOROETHYLENE

CAS # 127-18-4

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

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

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is tetrachloroethylene?

(Pronounced tĕt′rə-klôr′ ō-ĕth′ə-lēn′)

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

What happens to tetrachloroethylene when it enters the environment?

- ☐ Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- ☐ Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- ☐ In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- ☐ It does not appear to collect in fish or other animals that live in water.

How might I be exposed to tetrachloroethylene?

- ☐ When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- ☐ When you drink water containing tetrachloroethylene, you are exposed to it.

How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethylene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

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

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be performed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Tetrachloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

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

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

TOLUENE
CAS # 108-88-3

Division of Toxicology ToxFAQs™ **February 2001**

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

HIGHLIGHTS: Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

What happens to toluene when it enters the environment?

❑ Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petrolieum products as well as from leasking underground storage tanks at gasoline stations and other facilities.

❑ When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

❑ Toluene does not usually stay in the environment long.

❑ Toluene does not concentrate or buildup to high levels in animals.

How might I be exposed to toluene?

❑ Breathing contaminated workplace air or automobile exhaust.

❑ Working with gasoline, kerosene, heating oil, paints, and lacquers.

❑ Drinking contaminated well-water.

❑ Living near uncontrolled hazardous waste sites containing toluene products.

How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levles can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

How can toluene affect children?

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults.
Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

How can families reduce the risk of exposure to toluene?

☐ Use toluene-containing products in well-ventilated areas.

☐ When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

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

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

References

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

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

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AND DISEASE REGISTRY

XYLENE

CAS # 1330-20-7

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

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

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zī′lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

- ☐ Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- ☐ It evaporates quickly from the soil and surface water into the air.
- ☐ In the air, it is broken down by sunlight into other less harmful chemicals.
- ☐ It is broken down by microorganisms in soil and water.
- ☐ Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

- ☐ Breathing xylene in workplace air or in automobile exhaust.
- ☐ Breathing contaminated air.
- ☐ Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.
- ☐ Breathing cigarette smoke that has small amounts of xylene in it.
- ☐ Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.
- ☐ The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that xylene is not classifiable as to its carcinogenicity in humans.

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

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

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

The EPA requires that spills or accidental releases of xylenes into the environment of 1,000 pounds or more must be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

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

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES
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ZINC

CAS # 7440-66-6

Division of Toxicology ToxFAQs™ August 2005

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

HIGHLIGHTS: Zinc is a naturally occurring element. Exposure to high levels of zinc occurs mostly from eating food, drinking water, or breathing workplace air that is contaminated. Low levels of zinc are essential for maintaining good health. Exposure to large amounts of zinc can be harmful. It can cause stomach cramps, anemia, and changes in cholesterol levels. Zinc has been found in at least 985 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is zinc?

Zinc is one of the most common elements in the earth's crust. It is found in air, soil, and water, and is present in all foods. Pure zinc is a bluish-white shiny metal.

Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass, and bronze. A zinc and copper alloy is used to make pennies in the United States.

Zinc combines with other elements to form zinc compounds. Common zinc compounds found at hazardous waste sites include zinc chloride, zinc oxide, zinc sulfate, and zinc sulfide. Zinc compounds are widely used in industry to make paint, rubber, dyes, wood preservatives, and ointments.

What happens to zinc when it enters the environment?

❏ Some is released into the environment by natural processes, but most comes from human activities like mining, steel production, coal burning, and burning of waste.
❏ It attaches to soil, sediments, and dust particles in the air.
❏ Rain and snow remove zinc dust particles from the air.
❏ Depending on the type of soil, some zinc compounds can move into the groundwater and into lakes, streams, and rivers.
❏ Most of the zinc in soil stays bound to soil particles and does not dissolve in water.
❏ It builds up in fish and other organisms, but it does not build up in plants.

How might I be exposed to zinc?

❏ Ingesting small amounts present in your food and water.
❏ Drinking contaminated water or a beverage that has been stored in metal containers or flows through pipes that have been coated with zinc to resist rust.
❏ Eating too many dietary supplements that contain zinc.
❏ Working on any of the following jobs: construction, painting, automobile mechanics, mining, smelting, and welding; manufacture of brass, bronze, or other zinc-containing alloys; manufacture of galvanized metals; and manufacture of machine parts, rubber, paint, linoleum, oilcloths, batteries, some kind of glass, ceramics, and dyes.

How can zinc affect my health?

Zinc is an essential element in our diet. Too little zinc can cause problems, but too much zinc is also harmful.

Harmful effects generally begin at levels 10-15 times higher than the amount needed for good health. Large doses taken by mouth even for a short time can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia and decrease the levels of your good cholesterol. We do not know if high levels of zinc affect reproduction in humans. Rats that were fed large amounts of zinc became infertile.

Inhaling large amounts of zinc (as dusts or fumes) can cause a specific short-term disease called metal fume fever. We do not know the long-term effects of breathing high levels of zinc.

Putting low levels of zinc acetate and zinc chloride on the skin of rabbits, guinea pigs, and mice caused skin irritation. Skin irritation will probably occur in people.

How likely is zinc to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified zinc for carcinogenicity. Based on incomplete information from human and animal studies, the EPA has determined that zinc is not classifiable as to its human carcinogenicity.

How can zinc affect children?

Zinc is essential for proper growth and development of young children. It is likely that children exposed to very high levels of zinc will have similar effects as adults. We do not know whether children are more susceptible to the effects of excessive intake of zinc than the adults.

We do not know if excess zinc can cause developmental effects in humans. Animal studies have found decreased weight in the offspring of animals that ingested very high amounts of zinc.

How can families reduce the risks of exposure to zinc?

❏ Children living near waste sites that contain zinc may be exposed to higher levels of zinc through breathing contaminated air, drinking contaminated drinking water, touching or eating contaminated soil.
❏ Discourage your children from eating soil or putting their hands in their mouths and teach them to wash their hands frequently and before eating.
❏ If you use medicines or vitamin supplements containing zinc, make sure you use them appropriately and keep them out of the reach of children.

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

There are tests available to measure zinc in your blood, urine, hair, saliva, and feces. These tests are not usually done in the doctor's office because they require special equipment. High levels of zinc in the feces can mean high recent zinc exposure. High levels of zinc in the blood can mean high zinc consumption and/or high exposure. Tests to measure zinc in hair may provide information on long-term zinc exposure; however, the relationship between levels in your hair and the amount of zinc you were exposed to is not clear.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water should contain no more than 5 milligrams per liter of water (5 mg/L) because of taste. The EPA requires that any release of 1,000 pounds (or in some cases 5,000 pounds) into the environment be reported to the agency.

To protect workers, the Occupational Safety and Health Administration (OSHA) has set an average limit of 1 mg/m^3 for zinc chloride fumes and 5 mg/m^3 for zinc oxide (dusts and fumes) in workplace air during an 8-hour workday, 40-hour workweek.

Similarly, the National Institute for Occupational Safety and Health (NIOSH) has set the same standards for up to a 10-hour workday over a 40-hour workweek.

References

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

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

ATTACHMENT B

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

____ Medical Treatment

___ Non-disabling

___ First Aid Only

___ Fatality

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

ATTACHMENT C

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

ATTACHMENT D

SPECIAL REQUIREMENTS FOR COVID-19

ATTACHMENT E

ON-SITE AND OFF-SITE PROCEDURES TO LIMIT CONTAMINATION AND POTENTIAL SPREAD OF COVID-19

Sources: **CDC - COVID-19 Spread and Prevention Information; OSHA - Workplace Preparation Guidance; CDC - Guidance on Extended Use/Limited Reuse of Respiratory Protection**

1) Maintain minimum 6-foot separation from others whenever possible (social distancing). The virus is thought to spread mainly from person-to-person, between people who are in close contact, through respiratory droplets produced when an infected person coughs or sneezes.

2) Wash your hands frequently with soap and water. Wash for at least 20 seconds and, if no soap is present, use a hand sanitizer that contains at least 60% alcohol.

3) Wear nitrile gloves whenever possible and be especially mindful of touching common surfaces.

4) Disinfect commonly touched surfaces frequently, and items frequently used in public immediately upon returning home.

5) Face Coverings and Masks:

    a) On-site: Wear a cloth face covering or mask at all times when there is no issue with maintaining social distancing. N95/KN95 masks or respirators should be reserved for situations where social distancing on-site is difficult or impossible. Appropriate circumstances for donning an N95/KN95 mask or respirator on-site include, but are not necessarily limited to, going inside the Site trailer; and/or entering, exiting, or traversing the Site if proper social distancing cannot be achieved. This tiered approach will help maintain the supply of N95/KN95 masks so they are available for the highest risk scenarios.

    b) Off-site During Work-related Commute: The CDC now recommends wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain (https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html). A mask or cloth face covering should worn during your commute to and from the site if you are unable to achieve proper social distancing. Appropriate times to wear a mask or cloth face covering include, but are not necessarily limited to, walking on crowded sidewalks, traveling in a shared vehicle, and/or if you are required to enter an occupied indoor space to acquire supplies for the site.

6) Wear safety glasses or goggles at all times while on-site and some form of eye covering (e.g., sunglasses, prescription and non-prescription glasses, or safety glasses) should be considered when commuting.

7) Avoid touching your face (eyes, nose, and mouth).

8) Cover your nose and mouth when coughing, sneezing, etc./ cough into elbow.

9) Do not spit.

10) Try to take your temperature regularly.

11) Talk to your supervisor if you, your friends or family members that you live with or spend time with have displayed symptoms of COVID-19, tested positive, or are afflicted with even the common cold/flu.

12) Talk to your supervisor if anyone you know at the site tested positive for the COVID-19.

13) Follow any additional health & safety protocols required at the site or elsewhere.

APPENDIX C

PREVIOUS REPORTS