440 Park Avenue South, 7th Floor
New York, NY 10016
tel: 212.696.0670
www.akrf.com

Alexander Malamet
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 3
21 South Putt Corners Road
New Paltz, New York 12561

May 18, 2026

Re: Interim Remedial Measures Work Plan
20 South West Street Silversmith Site
BCP Site No.C360259
20 South West Street, Mount Vernon, NY

Dear Mr. Malamet:

Enclosed is the revised Remedial Investigation Work Plan (RIWP) for the 20 South West Street Silversmith Site, located at 20 South West Street in Mount Vernon, NY (BCP Site No. 360259). The IRMWP was revised to address comments provided by the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) in a letter to AKRF, Inc. dated April 29, 2026. Please see comment responses below and in reference to the attached IRMWP documents:

Modification 1, Section 4.3, Page 15: How was the volume of 11,000 cubic yards of soil expected to be removed calculated? As discussed, not all areas of the site are shown to need to be excavated to 14-15 ft below ground surface. This number seems too large.

AKRF Response: AKRF re-evaluated this number and based on the Site-wide contamination profile (based on analytical results), it is estimated that a total of ~7,800 CY of soil is expected to be removed during the remediation. This calculation also takes into account the volume of the existing basements, since no soil is present there to be removed.

Modification 2, Section 4.4, Page 15: Add a soil management plan to the work plan for excavated soils that will be staged onsite.

AKRF Response: Based on discussions with NYSDEC during a bi-weekly progress call held on May 1, 2026, it was determined that this comment can be omitted since sufficient language regarding soil management has already been included in the IRMWP.

If you have any questions or need any additional detail regarding the completeness of this revised Application, please feel free to contact Ashutosh Sharma at (646) 388-9865 or asharma@akrf.com.

Sincerely,
AKRF, Inc.

Axel Schwendt, QEP
Vice President

cc: S. McCague – NYSDEC
J. Apicella, – MacQuesten Station Takeover LLC
A. Sharma, T. Larigan – AKRF

20 SOUTH WEST STREET SILVERSMITH SITE

20 SOUTH WEST STREET
MOUNT VERNON, NEW YORK

Interim Remedial Measures Work Plan

AKRF Project Number: 250566
NYSDEC BCP Site Number: C360259

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation
21 South Putt Corners Road
New Paltz, New York 12561

Prepared on Behalf of:

MacQuesten Station Takeover LLC
438 Fifth Avenue, Suite 100
Pelham, NY 10803

Prepared by:

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

JANUARY 2026; REVISED MAY 2026

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CERTIFICATION

I, Rebecca Kinal, P.E., certify that I am currently a NYS registered Professional Engineer as defined in 6 NYCRR Part 375 and that this Interim Remedial Measures 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) and DER Green Remediation (DER-31).

Rebecca Kinal, P.E.		5/18/2026
Name	Signature	Date

1.0 INTRODUCTION

This Interim Remedial Measures (IRM) Work Plan (IRMWP) has been prepared by AKRF, Inc. (AKRF) on behalf of MacQuesten Station Takeover LLC (the "Participant") for the property located at 20 South West Street in Mount Vernon, Westchester County, New York (the Site). The Site is enrolled in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) (BCP Site No. C360259), and a Brownfield Cleanup Agreement (BCA) was executed on June 9, 2025 (Index No. C360259-05-25). The approximately 0.45-acre Site, which is also referred to as Tax Parcel ID 164.67-1057-16, is bounded to the north by Mount. Vernon Avenue, followed by a multi-tenant commercial property occupied by a liquor store, smoke shop, juice bar, tailor, nail salon, and a barber shop; to the east by South West Street, followed by commercial properties including two restaurants and an antique furniture store; to the south by a multi-story residential building with a daycare on the first floor; and to the west by the Mount Vernon train station and railroad tracks associated with the New York and Harlem Railroad, followed by the Bronx River. A Site Location Map is provided as Figure 1.

SESI Consulting Engineers, D.P.C. (SESI) performed a Phase I Environmental Site Assessment (ESA) (April 2016) and a Phase II ESA subsurface investigation (October 2016) at the Site. Roux Engineering, P.C. (Roux) performed a subsurface investigation for BCP eligibility (December 2024) at the Site. AKRF completed a Remedial Investigation (RI) between November and December 2025, and the sampling was conducted in accordance with a NYSDEC-approved Remedial Investigation Work Plan (RIWP) dated November 2025. Laboratory results from the investigations identified elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) and metals (arsenic, barium, cadmium, trivalent and total chromium, copper, lead, nickel, mercury, selenium, silver, and zinc) in soil, which appear to be associated with historical operations at the Site, including silversmith plating and environmental laboratory operations. Additionally, elevated concentrations of chloroform and metals (barium, beryllium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, sodium, and thallium) were identified in groundwater, which may be attributable to historical Site operations and/or regional groundwater conditions. Concentrations of petroleum-related and chlorinated solvent-related volatile organic compounds (VOCs) were detected in the soil vapor and sub-slab soil vapor, and indoor air samples (collected from existing building interior).

The proposed IRMs include demolition of the existing building, collection of Site-wide soil waste characterization samples for disposal purposes, limited excavation for the installation of support of excavation (SOE), limited backfill for trucking pads and SOE, and supplemental sampling (if required). Excavation will also include the removal of any petroleum storage tanks, fill ports, vent lines, etc. should they be encountered. The IRMs described in this Work Plan are being proposed to prepare the Site for full remediation to be completed under the Remedial Action Work Plan (RAWP), and for collection of any supplemental remedial investigation samples (if required) from currently inaccessible areas.

2.0 SITE DESCRIPTION AND HISTORY

A complete review of the Site description, surrounding land use, and local geology is included in the BCP Application and Draft Remedial Investigation Report (RIR), which is currently in progress. For the purposes of this IRMWP, this section includes a summary of the Site details.

2.1 Site Description and Surrounding Land Use

The Site consists of a rectangular-shaped, 0.45-acre parcel, which is also referred to as Tax Parcel ID 164.67-1057-16, and is currently developed with a two-story commercial use building occupied by a 7-Eleven convenience store and several other small commercial businesses, and a single-story structure that operates as a temporary station for the Mount Vernon Fire Department. The buildings are situated in the northern and western portions of the Site, and the southern and eastern portions consist of an asphalt-paved parking lot. The southern asphalt paved area/walkway also serves as the access pathway (easement area) to the west-adjacent Mount. Vernon train station. A Site Plan is provided as Figure 2.

The Site is bounded to the north by Mount. Vernon Avenue, followed by a multi-tenant commercial property occupied by a liquor store, smoke shop, juice bar, tailor, nail salon, and a barber shop; to the east by South West Street, followed by commercial properties including two restaurants and an antique furniture store; to the south by a multi-story residential building with a daycare on the first floor; and to the west by the Mount Vernon train station and railroad tracks associated with the New York and Harlem Railroad, followed by the Bronx River.

2.2 Site History

Based on the review of SESI's 2016 Phase I ESA, the Site was first developed in the late-1800s with residential buildings, stores, a hotel, and a carpenter shop. By 1916, the Site was redeveloped with the existing building, which operated as a Mount Vernon train station. From the 1960s through the present, several commercial businesses also operated on the Site, including a silversmith plating facility (between approximately 1961 and 2017) and an environmental laboratory (between 1978 and 1992), along with banks, pharmaceutical companies, taxi businesses, and artistic companies.

A temporary fire station has been present on the Site since 2022, and 7-Eleven has been operating in the Site building since approximately 2020.

2.3 Site Geology, Hydrogeology and Subsurface Characteristics

The Site is underlain by historic fill comprised of sand, gravel, and silt with varying amounts of asphalt, concrete, glass, brick, and ash from surface grade to between 10 to 15 feet below ground surface (bgs). The fill was underlain by apparent native sand, gravel, and silt to boring terminus at depths between approximately 10 to 25 feet bgs. Bedrock was not encountered during the RI. Based on AKRF's October 2025 Geotechnical Report, bedrock is estimated to be at approximate elevation +36.8 to +38.5 (surface elevation ranges from +80 to +82).

Based on the Site-specific groundwater measurements, groundwater beneath the Site ranges from 18.57 to 19.95 feet bgs (elevation +61.49 to +62.03). The Site-specific groundwater depths and elevation survey indicate groundwater beneath the Site flows in a southwesterly direction towards the Bronx River (the nearest body of water).

2.4 Nearby Areas of Public Concern

The uses immediately surrounding the Site are predominantly residential and commercial. The proposed future use of the Site is residential with below-grade parking and lower-level commercial uses.

On-Site Receptors: The Site is currently occupied by various commercial businesses and on-site receptors include the tenants and their daily clients. During redevelopment, potential receptors will include construction workers and inspectors. Once the Site is redeveloped, potential receptors will include residents, maintenance staff, and workers/customers associated with the future commercial uses.

Off-Site Receptors: Potential off-site receptors within a 0.25-mile radius of the Site include: residents, commercial and construction workers, students, pedestrians, and cyclists, based on the following:

1. Commercial Businesses – existing and future
2. Residential Buildings – existing and future
3. Building Construction/Renovation – existing and future
4. Pedestrians, Cyclists – existing and future
5. Schools – existing and future

3.0 PREVIOUS INVESTIGATIONS AND ENVIRONMENTAL FINDINGS

Various environmental studies have been completed for the Site to date. A review of the previous investigations is summarized below:

Phase I Environmental Site Assessment, 20 S. West Street (156 Mount Vernon Avenue), Mount Vernon, NY, SESI Consulting Engineers, April 2016

SESI prepared a Phase I ESA for the Site in April 2016 in accordance with the American Society for Testing and Materials (ASTM) Standard 1527-13, the standard at the time. The Phase I ESA included the findings of a Site reconnaissance and a review and evaluation of available historical records and regulatory database listings. The Phase I ESA identified two Recognized Environmental Conditions (RECs) and one Historic REC, as follows:

- REC-1 - Current Use of the Site: Suite 102 in the building was occupied by Artcraft Silversmith since the 1960s. It had an on-site workshop for plating and polishing of silver artifacts. The workshop stored various chemicals including copper sulphate, nickel sulphate, sodium hydroxide, potassium cyanide, and sodium cyanide, and had multiple industrial sinks for chemical processing. However, no related spills were reported in any databases and this business had the proper discharge permit.
- REC-2 - Historical Use of the Site - Environmental Laboratory: One of the historical tenants at the Site operated as an environmental laboratory, which involved the use of different solvents and the potential handling of hazardous materials. The details of the laboratory operation are unknown. However, no spills or any discharges were reported.
- HREC - 1,000-Gallon Aboveground Storage Tank (AST): A 1,000-gallon AST for heating oil was present in the basement of the building. A nine-gallon release from the AST was reported and closed by NYSDEC.

Phase II Environmental Site Assessment, 20 S. West Street, Mount Vernon, NY, SESI Consulting Engineers, October 18, 2016

SESI conducted a Phase II subsurface investigation in August and October 2016. The scope of the investigation was based on SESI's Phase I ESA findings, and included advancement of five soil borings with collection and analysis of 10 soil samples, installation of three temporary groundwater monitoring wells with collection and analysis of three groundwater samples, and installation of three temporary sub-slab soil vapor points with collection and analysis of three sub-slab soil vapor samples. The results of the Phase II ESA identified the following:

- *Soil* – No VOCs, semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, or cyanide were detected above NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) or Residential Soil Cleanup Objectives (RSCOs). Iron was detected above its RSCO in four samples, and lead, mercury, nickel, and zinc were detected above their UUSCOs but below their RSCOs in at least one sample.
- *Groundwater* – Chloroform was detected above its NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs) in one sample, and the metals barium, beryllium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, sodium, and thallium were detected above their AWQSGVs. No other VOCs, SVOCs, PCBs, pesticides, or metals were detected in the groundwater samples exceeding AWQSGVs.
- *Soil Vapor* – Petroleum-related VOCs [benzene, toluene, xylenes, n-heptane, n-hexane, n-butane, naphthalene, n-propylbenzene, sec-butylbenzene, 4-isopropyltoluene, 4-ethyltoluene, n-butylbenzene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene,] and solvent-related VOCs [tetrachloroethylene

(PCE), trichloroethylene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), carbon disulfide, chloroform, and methylene chloride] were detected at low-levels in sub-slab soil vapor samples.

The data generated during the investigation was not validated by a third-party data validator.

BCP Eligibility Investigation Summary Letter Report, 20 South West Street, Mount Vernon, NY, Roux Environmental Engineering and Geology, D.P.C., December 3, 2024

Roux performed a supplemental subsurface investigation in December 2024 to obtain additional soil data at the Site to support the NYSDEC BCP application, including an area in the basement that had not been previously investigated where the silversmith's workshop was historically present. The subsurface investigation included the advancement of 13 soil borings across the Site and the collection and laboratory analysis of soil samples from each. The findings of the investigation are summarized below:

- Historic fill material was observed in all borings that comprised of a mixture of predominantly sand and gravel with varying amounts of brick and silt.
- VOCs were not detected at concentrations above their NYSDEC Restricted Residential Soil Cleanup Objectives (RRSCOs). However, during soil screening activities using a photoionization detector (PID), slightly elevated VOC readings of up to 15.4 parts per million (ppm) were detected at soil boring RX-13 (central portion of the Site).
- The PAHs, benzo(a)pyrene and indeno(1,2,3-c,d)pyrene, were detected above their RRSCOs, at concentration of 1.1 milligrams per kilogram (mg/kg) and 0.8 mg/kg, respectively, in RX-5 (eastern portion of the Site).
- The metals, arsenic (maximum 44.5 mg/kg in RX-9), barium (maximum 721 mg/kg in RX-9), cadmium (maximum 47.2 mg/kg in RX-11), trivalent and total chromium (maximum 24,800 mg/kg in RX-9), copper (maximum 15,800 mg/kg in RX-11), lead (maximum 8,780 mg/kg in RX-9), nickel (maximum 874 mg/kg in RX-11), silver (maximum 259 mg/kg in RX-11), and zinc (11,700 mg/kg in RX-11) were detected at concentration above their RRSCOs in samples collected from the southwestern portion of the Site.

The data generated during the investigation was not validated by a third-party data validator. Roux concluded that, in general, the basement of the silversmith workshop appeared to contain soil with metals at concentrations significantly above the RRSCOs.

Remedial Investigation Work Plan, 20 South West Street Silversmith Site, BCP Site No. C360259, 20 South West Street, Mount Vernon, NY, AKRF, Inc. November 2025

AKRF prepared an RIWP to properly characterize environmental conditions at the Site, and to support development of a remedial plan in accordance with BCP requirements. The RIWP proposed the following for the RI at the Site: a geophysical survey across the accessible portions of the Site; the advancement of 14 soil borings from interior (including basements) and exterior locations with continuous soil sampling and laboratory analysis of two to four soil samples per boring; the installation of five permanent groundwater monitoring wells with the collection and analysis of five groundwater samples; the installation of eight subsurface and sub-slab soil vapor points with the collection and analysis of eight soil vapor samples; and, the collection of five indoor air samples from occupied tenant spaces. The RIWP was approved by the NYSDEC on November 19, 2025.

Draft Remedial Investigation Report, 20 South West Street, Mount Vernon, NY, AKRF, Inc. (currently being prepared)

An RI was conducted at the Site by AKRF between November 20 and December 5, 2025 pursuant to the November 2025 RIWP. A total of 52 soil samples, 5 groundwater samples, 5 soil vapor samples, 4 sub-slab

soil vapor samples, 5 indoor air samples, and 1 ambient air sample were collected for laboratory analysis. The sample collection and laboratory analysis adhered to NYSDEC's requirements for quality assurance/quality control (QA/QC), including Category B Reporting.

Soil cores at each boring location (RI-SB-01 through RI-SB-14) were observed for field evidence of contamination (e.g., petroleum-like odors, staining, etc.) and field-screened using a PID; and logged using the modified Burmister soil classification system with references to the Unified Soil Classification System (USCS). No staining was observed in any of the soil borings across the Site during the RI. PID readings of up to 4.8 ppm (RI-SB-12) were detected in the soil samples. No evidence of free phase product [i.e., non-aqueous phase liquid (NAPL)] was identified during the RI.

Groundwater samples were collected from five permanent groundwater monitoring wells (RI-MW-01 through RI-MW-05) using dedicated and decontaminated sampling equipment. No odors or indications of a sheen were noted at any of the monitoring wells during purging or sampling. No headspace PID readings were observed in the wells during sample collection, and no NAPL was detected during the RI.

Soil vapor samples were collected from 5 temporary soil vapor probes (RI-SV-01 through RI-SV-03, RI-SV-05, and RI-SV-08) installed in the exterior areas of the Site, and four sub-slab soil vapor probes (RI-SV-04, RI-SV-06, RI-SV-07, and RI-SV-09) installed inside the existing building's first floor and/or basement. Co-located indoor air samples (RI-IA-01 through RI-IA-04) were collected along with the sub-slab soil vapor samples; one additional indoor air sample (RI-IA-05) was collected from an active tenant space on the second floor; and one ambient air sample (RI-AA-01) was collected from the exterior of the building. The interior sub-slab soil vapor samples and co-located indoor air samples were collected as part of the soil vapor intrusion evaluation (SVIE).

The findings of the investigation are summarized below:

- *Soil* – PAHs were detected above their respective RRSCOs and/or UUSCOs in one or more of the samples collected. Metals including copper, lead, mercury, nickel, silver, and zinc were detected above their respective RRSCOs and/or UUSCOs in one or more samples, and perfluorooctanesulfonic acid (PFOS) was detected above its Unrestricted Use Guidance Value (UUGVs) but below its Restricted Residential Use Guidance Value (RRGVs) in one sample. PCBs and pesticides were not detected above their UUSCOs or RRSCOs. Acetone was detected above its NYSDEC UUSCO but below the RRSCO in four samples.
- *Groundwater* – Chloroform, benzo(a)pyrene, and naphthalene were each detected above their NYSDEC AWQSGVs in one sample. Ten metals including barium, chromium, copper, iron, lead, magnesium, manganese, nickel, sodium, and thallium were detected above their AWQSGVs in the total (unfiltered) metals analysis; four of these metals, including iron, magnesium, manganese, and sodium were detected above their AWQSGVs in the dissolved (filtered) metals analysis. PFOS and perfluorooctanoic acid (PFOA) were detected above their AWQSGVs in one or more samples. No other VOCs, SVOCs, PCBs, pesticides, or metals were detected in the groundwater samples exceeding AWQSGVs.
- *Soil Vapor (Exterior Samples)* – Petroleum- related VOCs, including benzene, toluene, ethylbenzene, xylenes (collectively referred to as "BTEX"), 1,3-butadiene, n-butane, acetone, tert-butyl alcohol (TBA), n-hexane, cyclohexane, n-heptane, 1,2,4-trimethylbenzene, 2,2,4-trimethylpentane, and 1,4-dichlorobenzene were detected in one or more samples at concentrations up to 67 micrograms per cubic meter ($\mu g/m^3$). Chlorinated solvent-related VOCs including TCE, PCE, 1,1,1-TCA, chloroform, and methylene chloride were detected in one or more samples at concentrations up to 130 $\mu g/m^3$.
- *Sub-Slab Soil Vapor and Indoor Air* – Petroleum-related VOCs including BTEX, 1,3-butadiene, n-butane, acetone, TBA, n-hexane, cyclohexane, n-heptane, 1,2,4-trimethylbenzene, 2,2,4-

trimethylpentane, and 1,4-dichlorobenzene were detected in one or more samples at concentrations up to 53 µg/m^3 (acetone in sample RI-IA-02_20251126 collected from the first floor of the Site building). Chlorinated solvent-related VOCs including TCE, PCE, 1,1,1-trichloroethane, chloroform, and methylene chloride were detected in one or more samples at concentrations up to 65 µg/m^3 (PCE in sample RI-IA-05_20251126 collected from the second floor of the Site building). Dichlorodifluoromethane and trichlorofluoromethane, CFCs commonly used as a refrigerant and a foaming or blowing agent, were detected in several of the sub-slab, indoor air, and ambient air samples at low levels.

- Twenty of the analyzed VOCs have NYSDOH matrices. Of the 20 VOCs with NYSDOH matrices, 16 were detected in at least one of the co-located sub-slab soil vapor and indoor air samples however, when the co-located sub-slab soil vapor and indoor air sample concentrations were compared to the decision matrices established by NYSDOH, the results were "No Further Action." The indoor air sample RI-IA-05_20251126, which was collected from the second floor was not compared to the decision matrices established by NYSDOH because there was no co-located sub-slab sample.

Soil sample concentrations, identified during the RI and previous investigations, above applicable standards are shown on Figures 3 and 4; groundwater sample concentrations, identified during the RI and previous investigations, above applicable standards are shown on Figures 5 and 6; soil vapor and indoor/ambient air sample concentrations identified during the RI are shown on Figure 7; and soil vapor sample concentrations identified during the previous investigations are shown on Figure 8.

4.0 INTERIM REMEDIAL MEASURES

Previous investigations at the Site have identified PAHs (a class of SVOCs), PFAS, and metals in soil/fill above UUSCOs and/or RRSCOs; VOCs, SVOCs, and metals in groundwater; VOCs in soil vapor and indoor air samples. The proposed IRM includes demolition of the existing building, collection of Site-wide soil waste characterization samples for disposal purposes, limited excavation for the installation of SOE, limited backfill for trucking pads and SOE, and supplemental sampling (if required). Excavation will also include the removal of any petroleum storage tanks, fill ports, vent lines, etc. should they be encountered. Off-site soil disposal will not occur under this IRMWP. The IRMs are required to prepare the Site for the upcoming remediation with the goal of achieving a Track 1 Cleanup.

This section outlines the scope of work and ensures that proper monitoring procedures, Site controls, and handling and disposal of contaminated materials are implemented during the implementation of the IRM.

4.1 Site Preparation

Prior to conducting any intrusive IRM activities, the work zone(s), designated entry points, soil stockpile staging areas, decontamination zones, and truck routes will be established on a Site plan figure, as applicable. The figure will be provided to NYSDEC prior to starting the IRM activities and the Site plan will be updated when necessary to reflect any changes in operations during the intrusive work. Dust and odor control measures will be implemented as outlined in Section 4.13. Additional details of Site preparation activities are provided in the following sections.

4.2 Demolition of Existing Building

Demolition of the existing building and dismantling of the temporary fire station is required to prepare the Site for upcoming remediation and to make contaminated soil accessible for removal and will occur prior to remedial excavation activities as part of the IRM. Due to safety concerns, foundation walls for the two partial basement areas (silversmith and mechanical basements) will be left in place and the areas will be temporarily backfilled with construction and demolition (C&D) debris generated during demolition. All excess C&D will be transported as an NYSDEC Part 360 solid waste to a municipal, state, or federal permitted processing, disposal, or recycling facility. Copies of disposal tickets/receipts for any C&D debris removed from the Site will be included in the IRM Construction Completion Report (IRMCCR). The building slabs and existing Site cover (pavement and walkways) will remain in place following the demolition. Based on the geotechnical investigation findings and to safely excavate and remove the contaminated soil across the Site (under the RAWP), the SOE will likely be designed and extended to approximately 40 feet below ground surface (bgs) to achieve the required excavation for a Track 1 Cleanup. The extent of the work is included in Figure 9.

A DOB demolition permit will be obtained prior to commencement of the demolition work. Demolition operations will be conducted in compliance with the City of Mount Vernon Building Code, the City of Mount Vernon Fire Code, and applicable Occupational Safety and Health (OSHA) regulations.

4.3 Pre-Excavation Soil Characterization

Soil waste characterization samples will be collected from across the Site following the building demolition. Based on these sampling results, one or more appropriately permitted waste disposal facilities will be selected for off-site disposal. The disposal facility information, including locations, will be submitted to the NYSDEC Project Manager for approval. No soil export will be completed under this IRMWP unless prior approval is received from NYSDEC. Based on the known

contamination (both horizontal and vertical) across the Site, it is estimated that a total of approximately 7,800 cubic yards of soil will be removed from the Site as part of future remediation (to be conducted under an NYSDEC-approved RAWP), as such, a total of 10 soil waste characterization samples will be collected. The estimated soil removal calculations account for existing basement spaces.

Waste characterization will be performed for off-site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results, and QA/QC will be reported in the FER.

4.4 Support of Excavation

Support of excavation (SOE) will be installed as necessary to enable excavation of contaminated soil and to prevent compromising adjacent properties, structures, and roadways. These activities will comply with applicable vibration monitoring requirements, and any local and state-controlled inspections. Limited excavation will be conducted via temporary test pits to remove obstructions (if encountered) and existing building's foundation elements to facilitate SOE installation. If required, any excess excavated material will be temporarily staged on-site and soil export is not planned under this IRMWP. The extent of the work is included in Figure 9.

4.5 Fluids Management

Dewatering is not anticipated at the Site during the implementation of this IRMWP; however, any liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed of in accordance with applicable local, State, and Federal regulations. The dewatered fluids would be pumped to frac tanks for temporary storage, as needed, and disposed of at an approved facility off-site. As an alternate to the off-site transport of dewatered fluids, adequately treated fluids may be discharged to a sanitary sewer upon approval from City of Mount Vernon, Westchester County Department of Environmental Facilities, and NYSDEC (as applicable). Dewatered fluids will not be recharged back to the land surface or subsurface of the Site without prior approval by NYSDEC. Discharge of water generated during remedial construction to surface waters (i.e., a local pond, stream or river) is prohibited without a State Pollutant Discharge Elimination System (SPDES) permit. Dewatering and treatment (if required) will be conducted in accordance with applicable local, state and federal regulation, as necessary, to enable the remedial excavation activities.

4.6 Temporary Staging Procedures

Any soil stockpiles generated during the SOE installation will be placed on and covered with polyethylene sheeting and secured with large rocks or other appropriate weights to protect against leaching or runoff of contaminants into groundwater or stormwater. Stockpiles will be managed to minimize dust generation, run-off and erosion, using water, plastic covers, silt fences, and/or hay bales, as necessary. A dedicated water hose connected to a fire hydrant will be available on-site for dust control. The location and classification of each staging area will be tracked on Site drawings and updated, as necessary, at the end of each workday. Copies of Site drawings will be kept in the field logbook.

4.7 Site Control Measures

The potential off-site transport of sediment, dust and organic vapors potentially generated during any soil excavation activities will be controlled by: covering soil stockpiles and/or open excavations with 6-mil polyethylene sheeting; backfilling open excavations with uncontaminated fill material;

decontaminating equipment used for soil excavation/sampling; providing drainage inlet protection for catch basins; and/or the use of odor-controlling spray foam, as warranted. These measures will be installed according to the requirements of all applicable or relevant and appropriate Federal, State and local laws. The Site will be fenced and closed to public, and access will be limited to the construction team.

4.8 Air Monitoring

Work zone and community air monitoring will be conducted during any ground intrusive work completed under this IRMWP. Air monitoring will not be required during building demolition. The protocol for implementing the work zone and community air monitoring will be completed in accordance with the site-specific HASP and CAMP, provided in Appendix A and B, respectively.

4.9 Quality Assurance/Quality Control

Measures will be taken to provide for quality assurance and maintain quality control of environmental sampling and remedial activities conducted under the IRMWP. A QAPP that describes the QA/QC protocols and procedures that will be followed during implementation of the IRM is included in Appendix C. Adherence to the QAPP will ensure that defensible data will be obtained during the implementation of the IRM.

4.10 Suspect UST Removals

If any USTs or other tanks are encountered during IRM activities, the tanks and appurtenances will be cleaned and closed/removed in accordance with accepted industry standards and applicable federal, state, and local regulatory agency requirements. Any tanks that cannot be removed would be closed in place, in accordance with accepted industry standards and applicable federal, state, and local regulatory agency requirements.

Tank closure, tank endpoint sampling, and any soil removal (if required) from the vicinity of any discovered USTs will be conducted in accordance with the NYSDEC DER-10, NYSDEC Divisions of Spills and Response Memorandum on Permanent Closure of Petroleum Storage Tanks, dated July 1998 and updated in December 2003, and NYSDEC Commissioner's Policy (CP)-51. Endpoint samples (if required) will be analyzed for target compound list (TCL) VOCs, SVOCs, TCL pesticides, PCBs, and TAL metals. These analyses will not be limited to the CP-51 parameters where tanks are identified without prior approval by NYSDEC.

Spill reporting to the NYSDEC Spill Hotline (800-457-7362) will be conducted, if deemed necessary in consultation with the NYSDEC BCP project manager.

Any unregistered tanks encountered at the Site will be registered, if required, with NYSDEC and/or Westchester County Department of Health (WCDOH) in accordance with Petroleum Bulk Storage (PBS) registration requirements. Tank closure activities and any associated petroleum-contaminated soil removal will be documented in the IRM Report.

4.11 Decontamination

Sampling equipment (hand auger, shovels, etc.) will be either dedicated or decontaminated between sampling locations. 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® and bristle brush.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment, if possible.

Excavation equipment including the excavator bucket will be decontaminated prior to being mobilized off-Site by steam cleaning using a tap water/Alconox® solution. Decontamination of all equipment will be conducted on plastic sheeting (or equivalent) that is bermed to prevent discharge to the ground.

4.12 Backfill from Off-Site Sources

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated properties will not be imported to the Site. All imported soil will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d). Approval will also be based on an evaluation of the land use, protection of groundwater, and protection of ecological resources criteria. Soil will be considered appropriate for use as on-Site imported backfill if contaminant concentrations are below the lesser of the 6 NYCRR Part 375 UUSCOs and Protection of Groundwater SCOs. Soil that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Native material from a New York State Department of Transportation (NYSDOT) designated virgin quarry source will not be sampled prior to use as backfill on the Site. Non-DOT designated virgin quarry sources, or non-virgin imported material that does not have an approved NYSDEC Beneficial Use Determination will be tested at the originating facility in accordance with Section 5.4(e) 10 of NYSDEC DER 10, and at a frequency indicated by the following table:

NYSDEC DER-10 Table 5.4(e) 10 Recommended Number of Soil Samples for Soil Imported To or Exported From a Site			
	VOCs (EPA Method 8260)	SVOCs (EPA Method 8270), Inorganics (EPA Method 600/7000 Series & PCBs/Pesticides (EPA Methods 8082/8081)	
Soil Quantity (cubic yards)	Discrete Samples	Composite Samples	Composite Sample Protocol
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1,000	7	2	
>1,000	Add an additional 2 VOC and 1 composite for each additional 1,000 cubic yards or consult with NYSDEC		

After compliance with the above import criteria is established for a specific source, adjustment of the sampling frequency may be requested by the NYSDEC.

Samples will be analyzed for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, TAL metals using EPA Method 6000/7000 series, PCBs using EPA Method 8082, pesticides using EPA Method 8081, and PFAS using EPA Method 1633A. All sampling of imported backfill will be conducted in accordance with the QAPP included in Appendix C.

All sampling data and source information will be submitted to NYSDEC for review and approval prior to importing backfill to the site.

4.13 Odor, Particulate, and Nuisance Controls

Odor Controls

Specific odor control methods to be used during implementation of the IRM will include the use of a PID to screen for VOCs and olfactory observations by a field technician. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. The NYSDEC and NYSDOH project managers will be notified of all odor events and of any other complaints about the project.

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

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

Particulate Controls

Particulate management during invasive on-site work will include, at a minimum, the items listed below, and is further detailed in the Site-specific CAMP, included in Appendix B:

- Site fencing will be adequately constructed of plywood and/or chain-link fencing with a mesh fabric fence screen to help contain dust and debris during remedial activities.
- Particulate suppression will be achieved through the use of a dedicated hose connected to a fire hydrant. The hose will be equipped with a nozzle capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of the Sites will be done in stages to limit the area of exposed, non-vegetated soils vulnerable to airborne particulate production.
- Crushed stone will be used on on-site roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water spraying.

Other Nuisances

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

5.0 REPORTING REQUIREMENTS

5.1 Interim Remedial Measures Construction Completion Report (CCR)

Daily reports will be prepared and submitted to NYSDEC and NYSDOH for each day during the demolition and when intrusive work occurs at the Site. Daily reports will also include a figure showing the work area and any temporary stockpile locations. Community Air Monitoring will be conducted pursuant to the CAMP (Appendix B). Upon completion of the field work and implementation of the IRM, an IRM Construction Completion Report (IRMCCR) will be prepared for inclusion in the FER and submitted to NYSDEC and NYSDOH. The IRM Report will include:

- Photographs of Site work and SOE installation;
- Air monitoring results and corrective actions taken (if required);
- Sampling results collected during implementation of the interim remedial measures (if required);
- Tabulated quantities of all material removed from the Site (if any) and associated manifests/bills of lading and certificates of disposal from the receiving facilities;
- Any tank removal or spill remediation (if appropriate) documentation; and,
- Documentation of source approval and sampling for any imported backfill material.

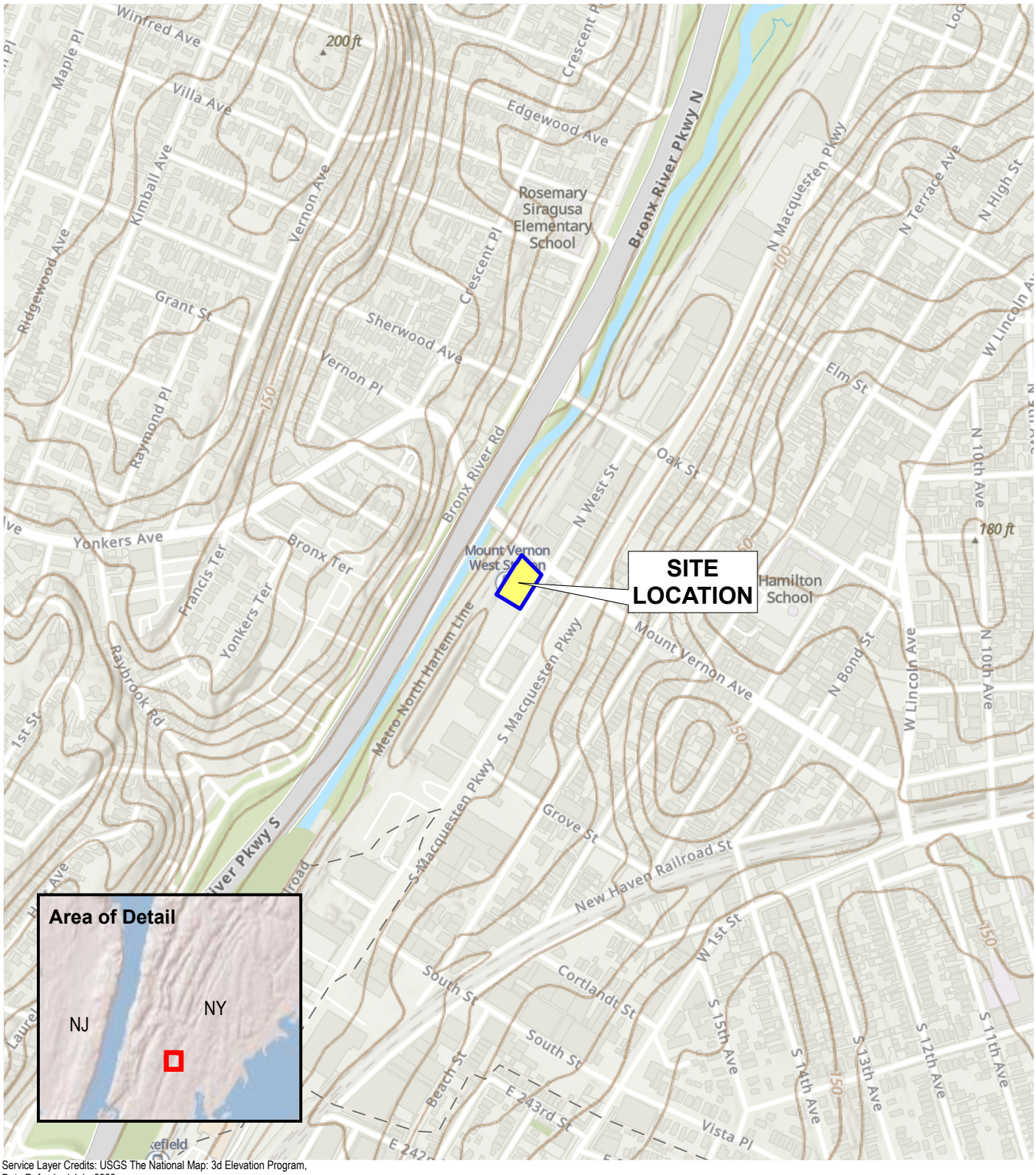
6.0 SCHEDULE OF WORK

The following tentative schedule has been developed for the project:

Table 1
Proposed Schedule

Activity	Time To Complete
BCA Execution	May 2025
Submittal of CPP	May 2025
Submittal of Draft RIWP	May 2025
30-day Public Comment Period for RIWP	September/October 2025
Submittal of Final RIWP	November 2025
Commence RI Field Activities	November/December 2025
Submit Draft IRMWP	January 2026
Submit Draft RIR	January 2026
Submit Draft RAWP	February 2026
IRMWP Comments Received	April 2026
RIR Comments Received	May 2026
Submittal of revised IRMWP and RIR	May 2026
Commence 45-day Public Comment Period for RAWP	May 2026
Submittal and Approval of Final IRMWP and RIR	May/June 2026
Draft of Environmental Easement (if required)	June 2026
RAWP Comments Received and Revised RAWP Submitted	June 2026
Submittal of Final RAWP	July/August 2026
Decision Document	September 2026
Tenants Vacate Building and IRMWP Implementation	September 2026
Issuance of Remedial/Construction Notice Fact Sheet	September 2026
Begin RAWP implementation	September/October 2026
Implement Remedial Action	September thru December 2026
Submittal of Draft Site Management Plan (SMP) (if required)	December 2026
Final Environmental Easement and SMP	February 2027
Submittal of Draft Final Engineering Report (FER)	January/February 2027
Final FER	April 2027
Certificate of Completion	April 2027

FIGURES



Service Layer Credits: USGS The National Map: 3d Elevation Program, Data Refreshed July, 2023

0 600 1,200
SCALE IN FEET

N

akrf
440 Park Avenue South, New York, NY 10016

20 South West Street Silversmith Site
20 South West Street
Mount Vernon, NY

SITE LOCATION

DATE
1/15/2026

PROJECT NO.
250566

FIGURE
1

AKRF O:\Projects\250566 - 20 SOUTH WEST STREET\SAR\250566 RI Figures.aprx\1/13/2026 7:41 PM\250566 Fig 1 BCP Site Location\jszalus

Aerial Source:
2023 New York State ITS GIS Orthoimagery

LEGEND

- PROJECT SITE BOUNDARY
- 164.68-1056-10 LOT BOUNDARY WITH SECTION-BLOCK-LOT NUMBER
- APPROXIMATE LOCATION OF MECHANICAL BASEMENT (AOC)
- APPROXIMATE LOCATION OF SILVERSMITH WORKSHOP BASEMENT (AOC)
- HISTORIC SOIL BORING (ROUX DECEMBER 2024)
- HISTORIC SUBSLAB SOIL VAPOR (SESI OCTOBER 2016)
- HISTORIC SOIL BORING (SESI OCTOBER 2016)
- SOIL BORING
- SOIL BORING/MONITORING WELL
- SOIL BORING/SOIL VAPOR POINT
- SOIL VAPOR POINT
- INDOOR SAMPLE LOCATION
- SOIL VAPOR POINT/INDOOR SAMPLE LOCATION
- AMBIENT AIR SAMPLE LOCATION

0 15 30 60
SCALE IN FEET

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20 South West Street Silversmith Site
20 South West Street
Mount Vernon, NY

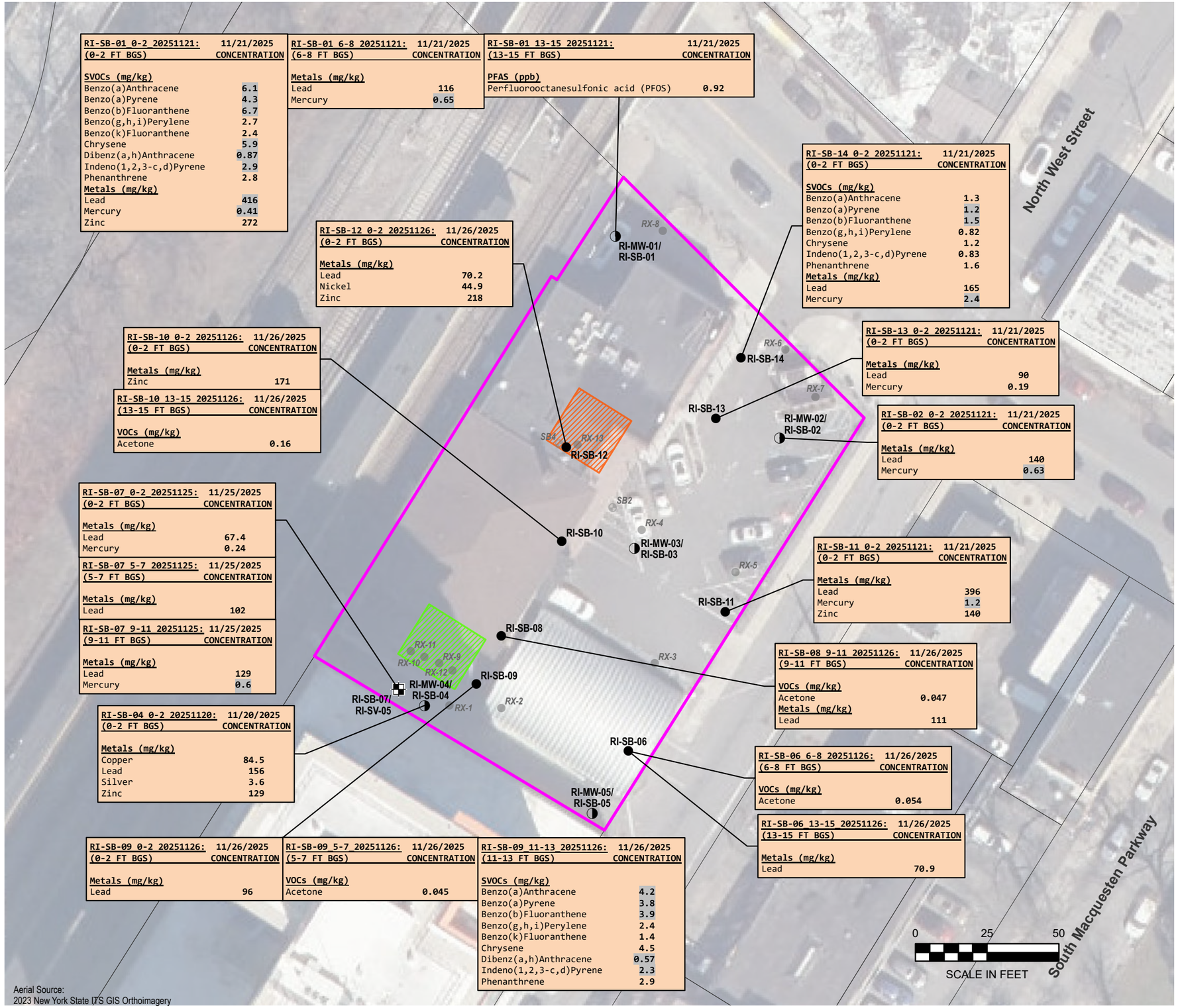
SITE PLAN AND SAMPLE LOCATIONS

DATE
1/15/2026

PROJECT NO.
250566

FIGURE
2

AKRF O:\Projects\250566 - 20 SOUTH WEST STREET\SAR\250566 RI Figures.aprx 1/14/2026 3:51 PM250566 Figure 2 BCP Site plan and Sample Location jszatus



LEGEND

N

- PROJECT SITE BOUNDARY
- 164.68-1056-10 LOT BOUNDARY WITH SECTION-BLOCK-LOT NUMBER
- APPROXIMATE LOCATION OF MECHANICAL BASEMENT (AOC)
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- HISTORIC SOIL BORING (SESI OCTOBER 2016)
- SOIL BORING
- SOIL BORING/MONITORING WELL
- SOIL BORING/SOIL VAPOR POINT

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 grey shading

milligrams per kilogram = parts per million (ppm)

	PART 375 RRSCOs (mg/kg)	PART 375 UUSCOs (mg/kg)
VOCs		
Acetone	100	0.03
SVOCs		
Benzo(a)Anthracene	1.4	1
Benzo(a)Pyrene	1	1
Benzo(b)Fluoranthene	1.4	1
Benzo(g,h,i)Perylene	4.9	0.64
Benzo(k)Fluoranthene	4.9	0.8
Chrysene	4.9	1
Dibenz(a,h)Anthracene	0.33	0.33
Indeno(1,2,3-c,d)Pyrene	1.4	0.5
Phenanthrene	4.9	1.1
Metals		
Copper	280	50
Lead	400	63
Mercury	0.3	0.18
Nickel	320	30
Silver	110	2
Zinc	6600	109
	PFAS GUIDANCE VALUES RRSCOs ppb	**PFAS GUIDANCE VALUES UUSCOs ppb**
PFAS		
Perfluorooctanesulfonic acid (PFOS)	44	0.88

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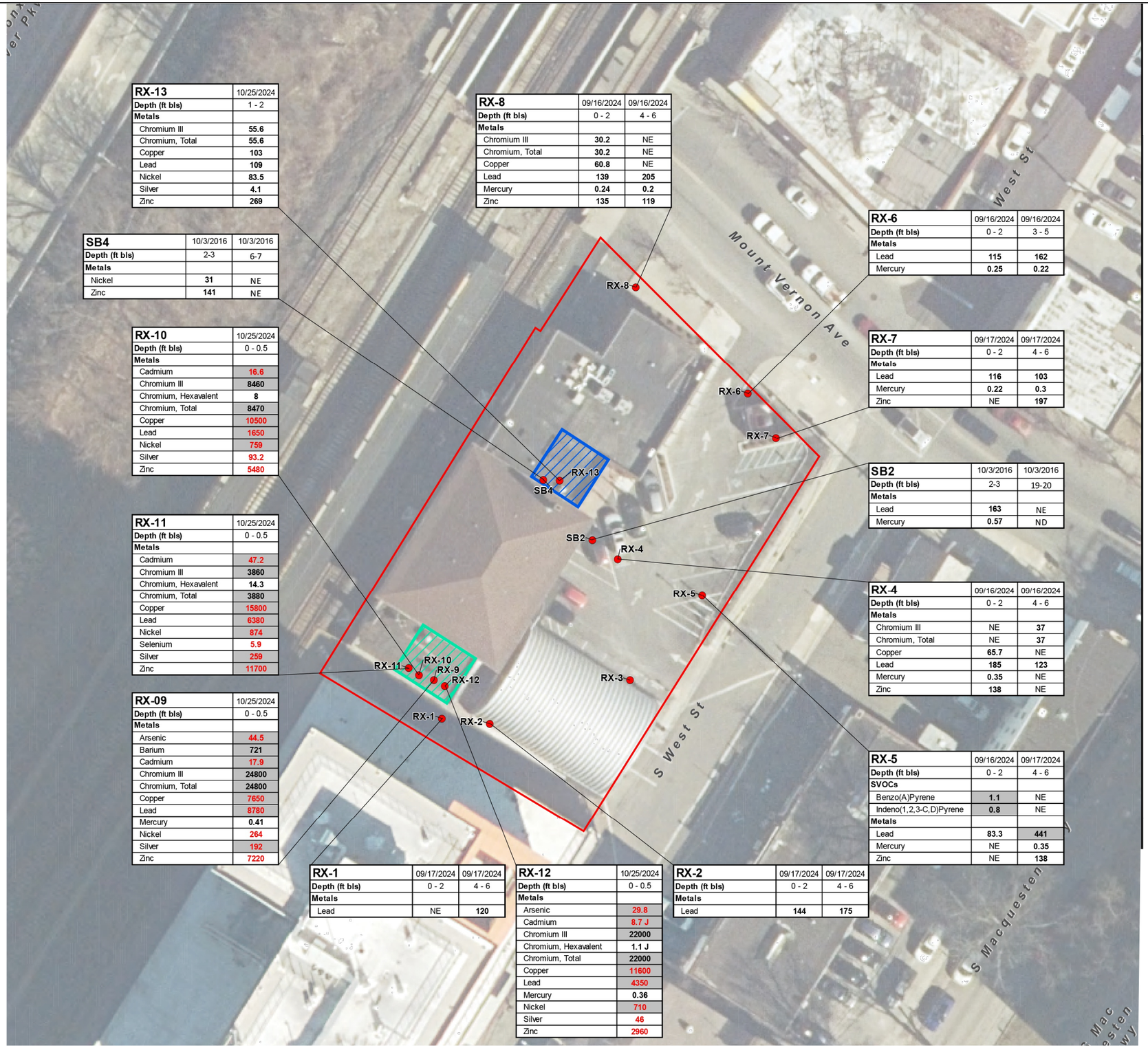
Mount Vernon, NY

Soil Sample Concentrations Above UUSCOs and RRSCOs and PFAS Guidance Values Identified During the Remedial Investigation

DATE
1/15/2026

PROJECT NO.
250566

FIGURE
3



RX-13	10/25/2024
Depth (ft bls)	1 - 2
Metals	
Chromium III	55.6
Chromium, Total	55.6
Copper	103
Lead	109
Nickel	83.5
Silver	4.1
Zinc	269

RX-8	09/16/2024	09/16/2024
Depth (ft bls)	0 - 2	4 - 6
Metals		
Chromium III	30.2	NE
Chromium, Total	30.2	NE
Copper	60.8	NE
Lead	139	205
Mercury	0.24	0.2
Zinc	135	119

SB4	10/3/2016	10/3/2016
Depth (ft bls)	2-3	6-7
Metals		
Nickel	31	NE
Zinc	141	NE

RX-6	09/16/2024	09/16/2024
Depth (ft bls)	0 - 2	3 - 5
Metals		
Lead	115	162
Mercury	0.25	0.22

RX-10	10/25/2024
Depth (ft bls)	0 - 0.5
Metals	
Cadmium	16.6
Chromium III	8460
Chromium, Hexavalent	8
Chromium, Total	8470
Copper	10500
Lead	1650
Nickel	759
Silver	93.2
Zinc	5480

RX-7	09/17/2024	09/17/2024
Depth (ft bls)	0 - 2	4 - 6
Metals		
Lead	116	103
Mercury	0.22	0.3
Zinc	NE	197

SB2	10/3/2016	10/3/2016
Depth (ft bls)	2-3	19-20
Metals		
Lead	163	NE
Mercury	0.57	ND

RX-11	10/25/2024
Depth (ft bls)	0 - 0.5
Metals	
Cadmium	47.2
Chromium III	3860
Chromium, Hexavalent	14.3
Chromium, Total	3880
Copper	15800
Lead	6380
Nickel	874
Selenium	5.9
Silver	259
Zinc	11700

RX-4	09/16/2024	09/16/2024
Depth (ft bls)	0 - 2	4 - 6
Metals		
Chromium III	NE	37
Chromium, Total	NE	37
Copper	65.7	NE
Lead	185	123
Mercury	0.35	NE
Zinc	138	NE

RX-09	10/25/2024
Depth (ft bls)	0 - 0.5
Metals	
Arsenic	44.5
Barium	721
Cadmium	17.9
Chromium III	24800
Chromium, Total	24800
Copper	7650
Lead	8780
Mercury	0.41
Nickel	264
Silver	192
Zinc	7220

RX-5	09/16/2024	09/17/2024
Depth (ft bls)	0 - 2	4 - 6
SVOCs		
Benzo(A)Pyrene	1.1	NE
Indeno(1,2,3-C,D)Pyrene	0.8	NE
Metals		
Lead	83.3	441
Mercury	NE	0.35
Zinc	NE	138

RX-1	09/17/2024	09/17/2024
Depth (ft bls)	0 - 2	4 - 6
Metals		
Lead	NE	120

RX-12	10/25/2024
Depth (ft bls)	0 - 0.5
Metals	
Arsenic	29.8
Cadmium	8.7 J
Chromium III	22000
Chromium, Hexavalent	1.1 J
Chromium, Total	22000
Copper	11600
Lead	4350
Mercury	0.36
Nickel	710
Silver	46
Zinc	2960

RX-2	09/17/2024	09/17/2024
Depth (ft bls)	0 - 2	4 - 6
Metals		
Lead	144	175

N

Parameter	NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Restricted Residential Soil Cleanup Objectives	NYSDEC Part 375 Protection of Groundwater Soil Cleanup Objectives	Units
VOCs	NE	NE	NE	mg/kg
SVOCs				
Benzo(A)Pyrene	1	1	22	mg/kg
Indeno(1,2,3-C,D)Pyrene	0.5	0.5	8.2	mg/kg
Metals				
Arsenic	13	16	16	mg/kg
Barium	350	400	820	mg/kg
Cadmium	2.5	4.3	7.5	mg/kg
Chromium III	30	180	--	mg/kg
Chromium, Hexavalent	1	110	19	mg/kg
Chromium, Total	30	180	--	mg/kg
Copper	50	270	1720	mg/kg
Lead	63	400	450	mg/kg
Mercury	0.18	0.81	0.73	mg/kg
Nickel	30	310	130	mg/kg
Selenium	3.9	180	4	mg/kg
Silver	2	180	8.3	mg/kg
Zinc	109	10000	2480	mg/kg

LEGEND

- SOIL BORING LOCATIONS
- APPROXIMATE LOCATION OF SILVERSMITH WORKSHOP BASEMENT
- APPROXIMATE LOCATION OF MECHANICAL BASEMENT
- SITE BOUNDARY

NOTES

1. AERIAL SOURCE: NYS OFFICE OF INFORMATION TECHNOLOGY SERVICES GIS PROGRAM OFFICE (GPO)
2. SOIL BORINGS SB2 AND SB4 COMPLETED BY SESI CONSULTING ENGINEERS, PC IN 2016.
3. SAMPLES RX-1 THROUGH RX-13 COLLECTED BY ROUX ENGINEERING, P.C. IN 2024.

MG/KG - MILLIGRAMS PER KILOGRAM
NYSDEC - NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
-- NO NYSDEC PART 375 SOIL CLEANUP OBJECTIVES AVAILABLE
J - ESTIMATED VALUE
VOCs - VOLATILE ORGANIC COMPOUNDS
SVOCs - SEMIVOLATILE ORGANIC COMPOUNDS
NE - NO EXCEEDANCE
ND - NO DETECTION
FT BLS - FEET BELOW LAND SURFACE

0 20 40 80
SCALE IN FEET

SOURCE:
Based on Figure A-001.00, *BCP ELIGIBILITY SAMPLING LOCATIONS AND SUMMARY OF EXCEEDANCES IN SOIL*, Prepared by ROUX Jan 2025

akrf
440 Park Avenue South, New York, NY 10016

20 South West Street Silversmith Site

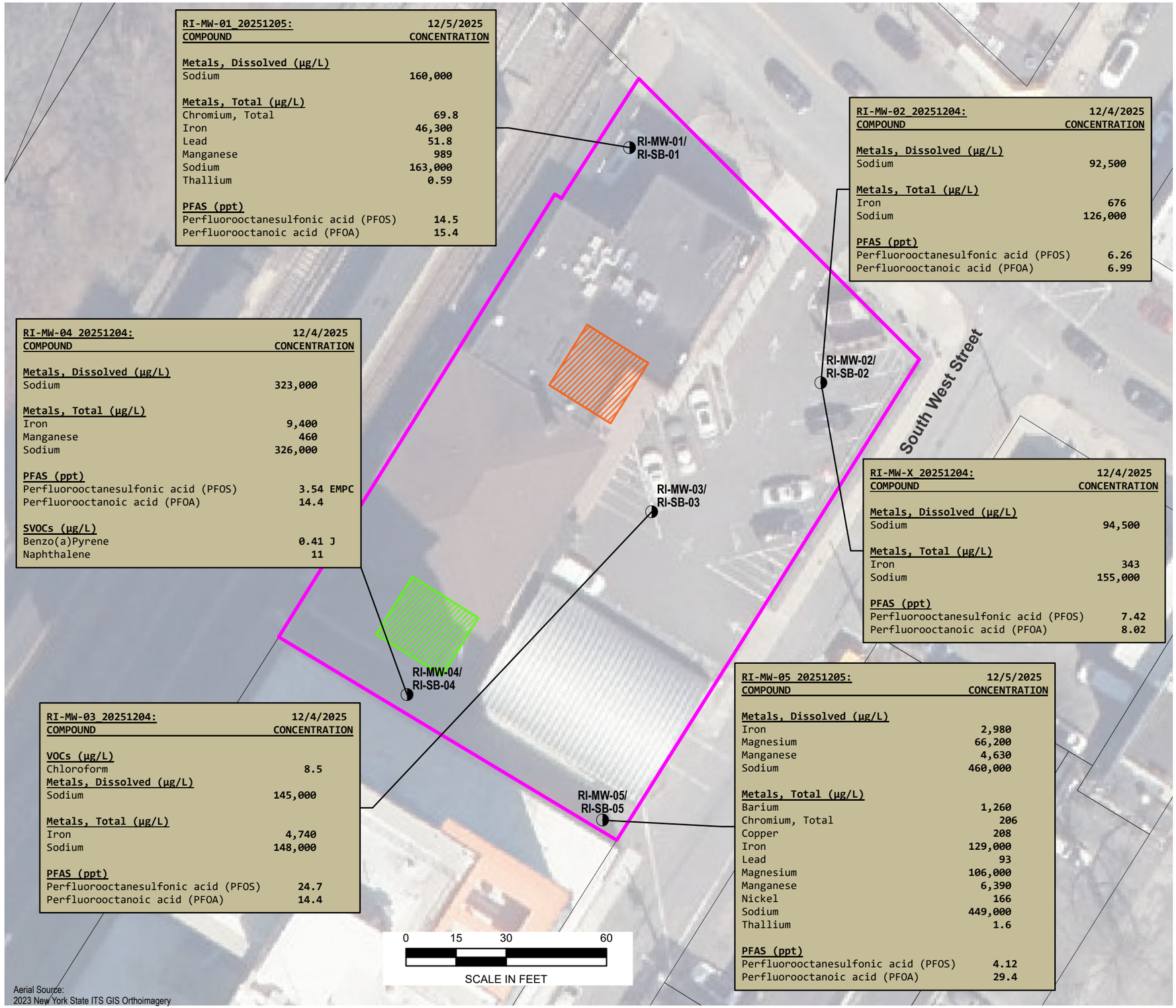
20 South West Street
Mount Vernon, NY

Soil Sample Concentrations Above UUSCOs and RRSCOs and PFAS Guidance Values Identified During the Previous Subsurface Investigations

DATE
1/15/2026

PROJECT NO.
250566

FIGURE
4



RI-MW-01_20251205: 12/5/2025

COMPOUND	CONCENTRATION
Metals, Dissolved (µg/L)	
Sodium	160,000
Metals, Total (µg/L)	
Chromium, Total	69.8
Iron	46,300
Lead	51.8
Manganese	989
Sodium	163,000
Thallium	0.59
PFAS (ppt)	
Perfluorooctanesulfonic acid (PFOS)	14.5
Perfluorooctanoic acid (PFOA)	15.4

RI-MW-02_20251204: 12/4/2025

COMPOUND	CONCENTRATION
Metals, Dissolved (µg/L)	
Sodium	92,500
Metals, Total (µg/L)	
Iron	676
Sodium	126,000
PFAS (ppt)	
Perfluorooctanesulfonic acid (PFOS)	6.26
Perfluorooctanoic acid (PFOA)	6.99

RI-MW-04_20251204: 12/4/2025

COMPOUND	CONCENTRATION
Metals, Dissolved (µg/L)	
Sodium	323,000
Metals, Total (µg/L)	
Iron	9,400
Manganese	460
Sodium	326,000
PFAS (ppt)	
Perfluorooctanesulfonic acid (PFOS)	3.54 EMPC
Perfluorooctanoic acid (PFOA)	14.4
SVOCs (µg/L)	
Benzo(a)Pyrene	0.41 J
Naphthalene	11

RI-MW-X_20251204: 12/4/2025

COMPOUND	CONCENTRATION
Metals, Dissolved (µg/L)	
Sodium	94,500
Metals, Total (µg/L)	
Iron	343
Sodium	155,000
PFAS (ppt)	
Perfluorooctanesulfonic acid (PFOS)	7.42
Perfluorooctanoic acid (PFOA)	8.02

RI-MW-03_20251204: 12/4/2025

COMPOUND	CONCENTRATION
VOCs (µg/L)	
Chloroform	8.5
Metals, Dissolved (µg/L)	
Sodium	145,000
Metals, Total (µg/L)	
Iron	4,740
Sodium	148,000
PFAS (ppt)	
Perfluorooctanesulfonic acid (PFOS)	24.7
Perfluorooctanoic acid (PFOA)	14.4

RI-MW-05_20251205: 12/5/2025

COMPOUND	CONCENTRATION
Metals, Dissolved (µg/L)	
Iron	2,980
Magnesium	66,200
Manganese	4,630
Sodium	460,000
Metals, Total (µg/L)	
Barium	1,260
Chromium, Total	206
Copper	208
Iron	129,000
Lead	93
Magnesium	106,000
Manganese	6,390
Nickel	166
Sodium	449,000
Thallium	1.6
PFAS (ppt)	
Perfluorooctanesulfonic acid (PFOS)	4.12
Perfluorooctanoic acid (PFOA)	29.4

Aerial Source:
2023 New York State ITS GIS Orthoimagery

LEGEND

N

- PROJECT SITE BOUNDARY
- 164.68-1056-10 LOT BOUNDARY WITH SECTION-BLOCK-LOT NUMBER
- APPROXIMATE LOCATION OF MECHANICAL BASEMENT (AOC)
- APPROXIMATE LOCATION OF SILVERSMITH WORKSHOP BASEMENT (AOC)
- SOIL BORING/MONITORING WELL

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

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

Only Exceedances of NYSDEC AWQSGVs are shown in bold font.

E: Identifies compounds whose concentration exceed the calibration range of the instrument for that specific analysis.
M: Indicates that the duplicate injection precision was not met.
P: Indicates a pesticide/aroclor target analyte had a percent difference greater than 25% between the two gc columns. The lower of the two results is reported.
C: Indicates pesticide results have been confirmed by gc/ms. Also c with a number indicates a coeluting congener peak.

RI-MW-X_20251204 is a blind duplicate of sample RI-MW-02_20251204.

	NYSDEC TOGS Class GA AWQS (µg/L)
VOCs	
Chloroform	7
SVOCs	
Benzo(a)Pyrene	0
Naphthalene	10
Metals, Total	
Barium	1,000
Chromium, Total	50
Copper	200
Iron	300
Lead	25
Magnesium	35,000
Manganese	300
Nickel	100
Sodium	20,000
Thallium	0.5
Metals, Dissolved	
Iron	300
Magnesium	35,000
Manganese	300
Sodium	20,000

akrf
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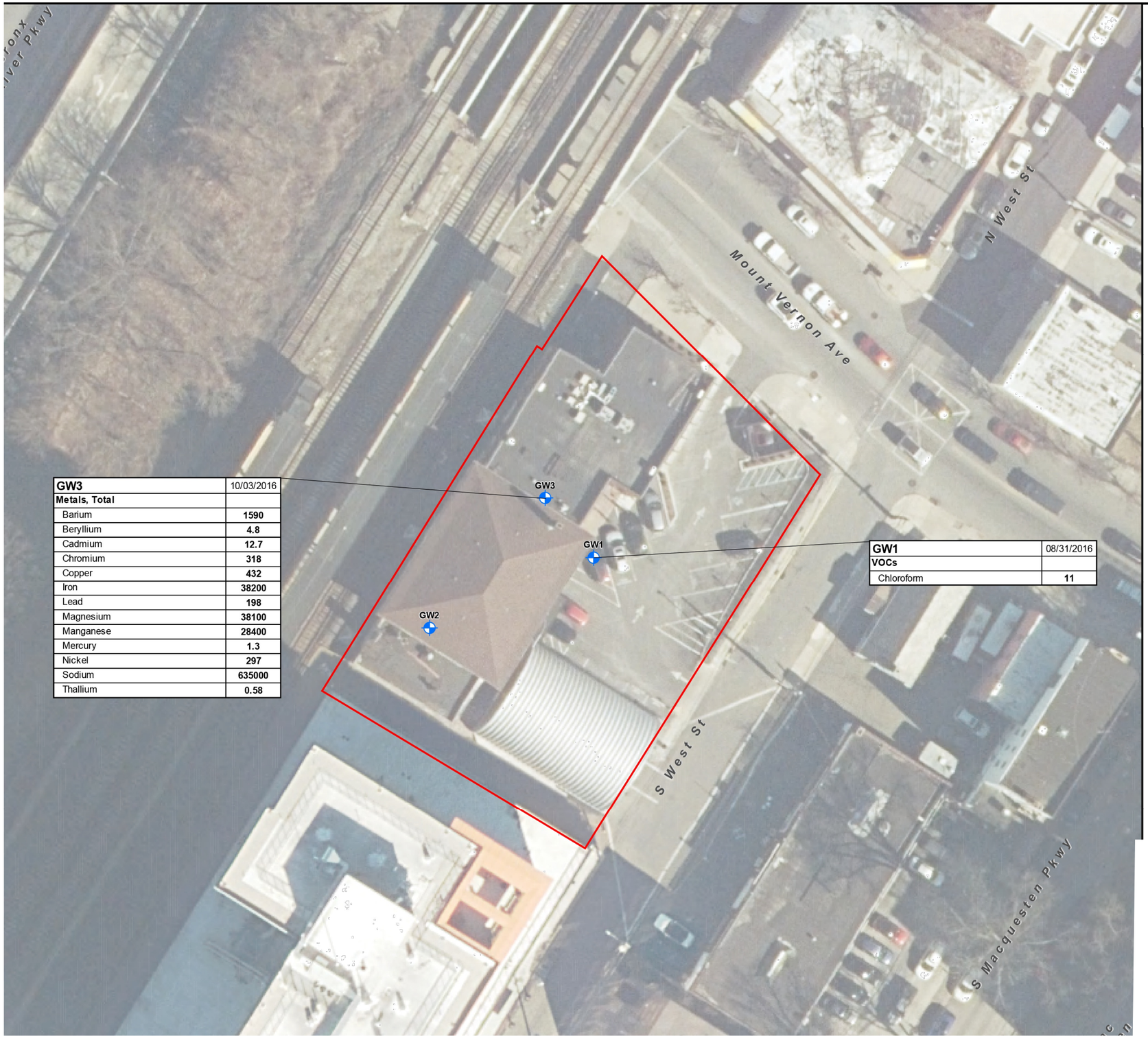
20 South West Street Silversmith Site
20 South West Street
Mount Vernon, NY

Groundwater Sample Concentrations Above AWQSGVs and PFAS Guidance Levels Identified During the Remedial Investigation

DATE
1/15/2026

PROJECT NO.
250566

FIGURE
5



GW3	10/03/2016
Metals, Total	
Barium	**1590**
Beryllium	**4.8**
Cadmium	**12.7**
Chromium	**318**
Copper	**432**
Iron	**38200**
Lead	**198**
Magnesium	**38100**
Manganese	**28400**
Mercury	**1.3**
Nickel	**297**
Sodium	**635000**
Thallium	**0.58**

GW1	08/31/2016
VOCs	
Chloroform	**11**

Parameter	NYSDEC AWQSGV	Units
VOCs		
Chloroform	**7**	µg/L
Metals		
Barium	**1000**	µg/L
Beryllium	**3**	µg/L
Cadmium	**5**	µg/L
Chromium	**50**	µg/L
Copper	**200**	µg/L
Iron	**300**	µg/L
Lead	**25**	µg/L
Magnesium	**35000**	µg/L
Manganese	**300**	µg/L
Mercury	**0.7**	µg/L
Nickel	**100**	µg/L
Sodium	**20000**	µg/L
Thallium	**0.5**	µg/L

N

LEGEND

GROUNDWATER SAMPLE LOCATION

SITE BOUNDARY

NOTES

1. AERIAL SOURCE: NYS OFFICE OF INFORMATION TECHNOLOGY SERVICES GIS PROGRAM OFFICE (GPO)
2. CONCENTRATIONS IN µG/L
3. GROUNDWATER SAMPLES COLLECTED BY SESI CONSULTING ENGINEERS, PC.

µG/L - MICROGRAMS PER LITER
NYSDEC - NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AWQSGVS - AMBIENT WATER-QUALITY STANDARDS AND GUIDANCE VALUES
-- NO NYSDEC AWQSGV AVAILABLE
VOCS - VOLATILE ORGANIC COMPOUNDS

0 20 40 80
SCALE IN FEET

SOURCE:
Based on Figure A-001.00, *BCP ELIGIBILITY SAMPLING LOCATIONS AND SUMMARY OF EXCEEDANCES IN GROUNDWATER*, Prepared by ROUX Jan 2025

akrf
440 Park Avenue South, New York, NY 10016

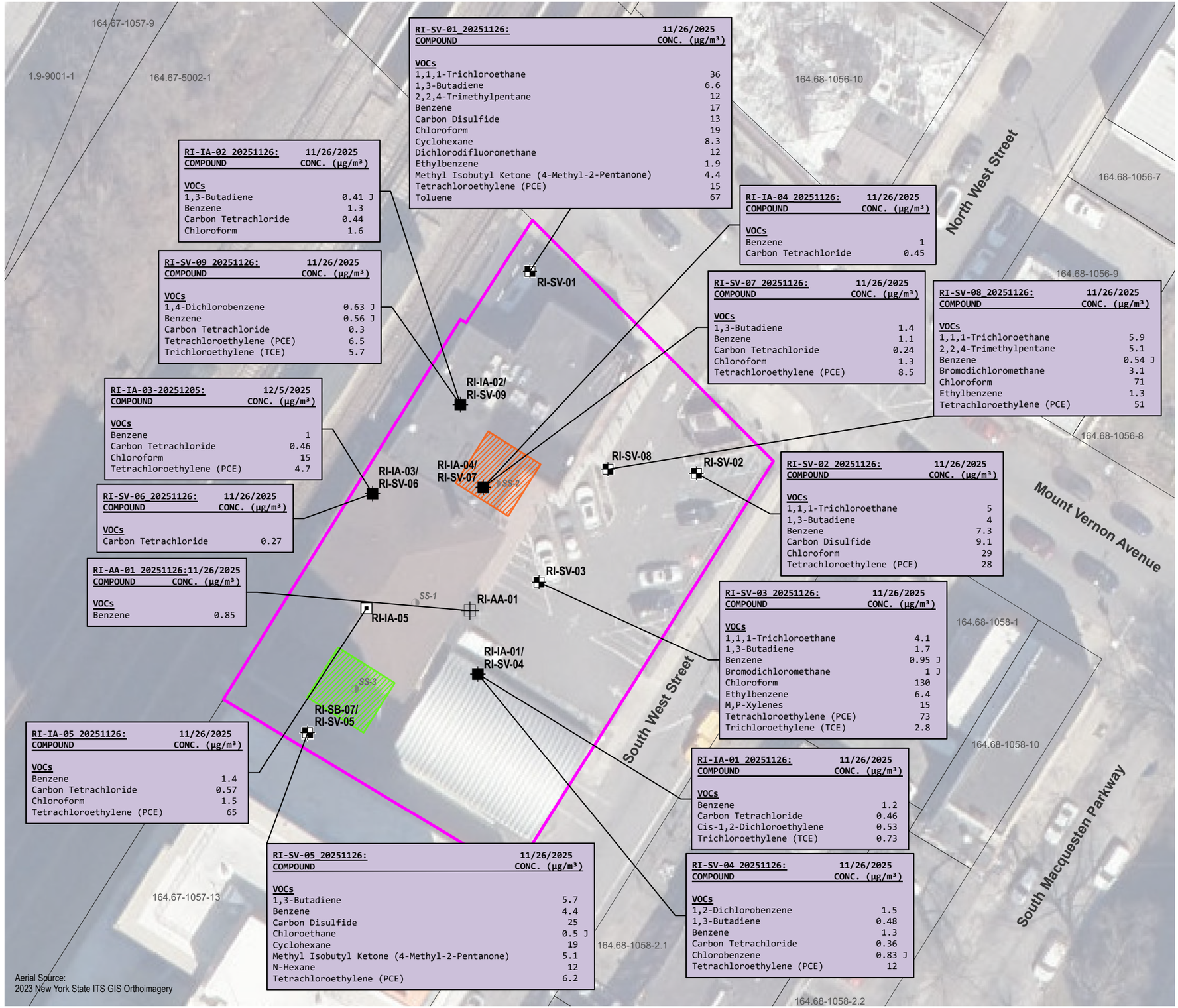
20 South West Street Silversmith Site
20 South West Street
Mount Vernon, NY

Groundwater Sample Concentrations Above AWQSGVs and PFAS Guidance Levels Identified During the Previous Investigations

DATE
1/15/2026

PROJECT NO.
250566

FIGURE
6



N

LEGEND

- PROJECT SITE BOUNDARY
- 164.68-1056-10 LOT BOUNDARY WITH SECTION-BLOCK-LOT NUMBER
- APPROXIMATE LOCATION OF MECHANICAL BASEMENT (AOC)
- APPROXIMATE LOCATION OF SILVERSMITH WORKSHOP BASEMENT (AOC)
- HISTORIC SUBSLAB SOIL VAPOR (SESI OCTOBER 2016)
- SOIL BORING/SOIL VAPOR POINT
- SOIL VAPOR POINT
- INDOOR SAMPLE LOCATION
- SOIL VAPOR POINT/INDOOR SAMPLE LOCATION
- AMBIENT AIR SAMPLE LOCATION

SOIL VAPOR

µg/m³- micrograms per cubic meter

J: The reported value is estimated.

0 25 50

SCALE IN FEET

akrf
440 Park Avenue South, New York, NY 10016

20 South West Street Silversmith Site
20 South West Street
Mount Vernon, NY

Soil Vapor and Indoor/Ambient Air Sample Concentrations Identified During the Remedial Investigation

DATE
1/15/2026

PROJECT NO.
250566

FIGURE
7

AKRF O:\Projects\250566 - 20 SOUTH WEST STREET\SAR\250566 RI Figures.aprx 9/22/2025 5:52 PM250566 Figure 10 Soil Vapor Sample Concentrations Identified During the Remedial Investigation jszalus

SS-2	8/30/2016
VOCs	**µg/m3**
Acetone	27
Carbon tetrachloride	1.2
Methylene chloride	2.2
Methyl ethyl ketone	2.3
Tetrachloroethene	35
Toluene	1.2
Trichloroethene	0.58
Trichlorofluoromethane	1.1
Difluorochloromethane (Freon 22)	1.8

SS-1	8/30/2016
VOCs	**µg/m3**
Acetone	95
Benzene	1.3
1,3-Butadiene	1.3
Chloroform	3.8
Carbon disulfide	4.9
n-Heptane	6.9
n-Hexane	12
Methyl ethyl ketone	18
Tetrachloroethene	54
Toluene	2
1,1,1-Trichloroethane	2.4
Trichlorofluoromethane	1.8
Difluorochloromethane (Freon 22)	7.7
n-Butane	29

SS-3	8/30/2016
VOCs	**µg/m3**
Acetone	54
Chloroform	17
Carbon tetrachloride	2.5
4-Ethyltoluene	3.3
Methylene chloride	100
Methyl ethyl ketone	4.4
Tetrachloroethene	24
Toluene	4.8
Trichloroethene	0.25
Trichlorofluoromethane	1.1
1,2,4-Trimethylbenzene	35
1,3,5-Trimethylbenzene	9.8
Xylenes (m&p)	3.2
Xylenes (o)	1.4
Xylene (total)	4.6
Naphthalene	92
Difluorochloromethane (Freon 22)	1.8
n-Propylbenzene	1.7
sec-Butylbenzene	2.3
4-Isopropyltoluene	4.5
n-Butylbenzene	7.1

N

LEGEND:

SUB-SLAB SOIL VAPOR SAMPLE LOCATION

SITE BOUNDARY

NOTES:

µg/m3 - MICROGRAMS PER CUBIC METER

VOCS - VOLATILE ORGANIC COMPOUNDS

SOIL VAPOR SAMPLES COLLECTED BY SESI CONSULTING ENGINEERS P.C. IN 2016

25 0 25

SCALE IN FEET

SOURCE:
Based on Figure A-001.00, *BCP ELIGIBILITY SAMPLING LOCATIONS AND SUMMARY OF EXCEEDANCES IN GROUNDWATER*, Prepared by ROUX Jan 2025

akrf
440 Park Avenue South, New York, NY 10016

20 South West Street Silversmith Site
20 South West Street
Mount Vernon, NY

Soil Vapor Sample Concentrations Identified During the Previous Investigations

DATE
1/15/2026

PROJECT NO.
250566

FIGURE
8

akrf
440 Park Avenue South, New York, NY 10016

20 South West Street Silversmith Site
20 South West Street
Mount Vernon, NY

EXTENT OF IRM ACTIVITIES

DATE
3/4/2026
PROJECT NO.
250566
FIGURE
9

APPENDIX A

HEALTH AND SAFETY PLAN

20 SOUTH WEST STREET SILVERSMITH SITE

20 SOUTH WEST STREET
MOUNT VERNON, NEW YORK

Health and Safety Plan

BCP Site No.: C360259
AKRF Project Number: 250566

Prepared for:

MacQuesten Station Takeover LLC
438 Fifth Avenue, Suite 100
Pelham, NY 10803

Prepared by:

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

JANUARY 2026, REVISED MAY 2026

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FIGURES

APPENDICES

1.0 INTRODUCTION

This environmental Health and Safety Plan (HASP) has been developed for use during the implementation of the Interim Remedial Measures (IRM) Work Plan (IRMWP) activities conducted by all on-site personnel, both AKRF employees and others, at the 20 South West Street Silversmith site, located at 20 South West Street in Mount Vernon, Westchester County, New York (the Site), also identified as Tax Parcel ID 164.67-1057-16. The Site consists of a two-story commercial building occupied by a 7-Eleven convenience store and several other small commercial businesses, and a single-story structure that operates as a temporary station for the Mount Vernon Fire Department. The building and structure are situated in the northern and western portions of the Site, and the remainder of the property comprises exterior asphalt paved areas. The IRMWP activities will include building demolition, the installation of soil borings and collection of soil samples for waste classification, limited excavation for support of excavation (SOE), limited backfill for SOE or trucking pads, and any supplemental sampling (if required). This HASP does not discuss routine health and safety issues common to general construction/excavation, including but not limited to slips, trips, falls, shoring, and other physical hazards.

Available records have documented that the property was historically developed with commercial uses, including a silversmith plating facility from approximately 1961 to 2017 and an environmental laboratory from 1978 to 1992. Based on investigations conducted to date, identified contamination at the Site includes polycyclic aromatic hydrocarbons (PAHs), per- and polyfluoroalkyl substances (PFAS), and heavy metals in soil; VOCs, semi-volatile organic compounds (SVOCs), and metals in groundwater; and VOCs in soil vapor. This HASP identifies the hazards of concern, the specific chemicals associated with the Site-specific hazards, and measures to provide protection from exposure to the hazards during the investigation and intrusive work.

All AKRF employees are directed that all work must be performed in accordance with the Company's Generic HASP and all United States Occupational Safety and Health Administration (OSHA)-applicable regulations for the work activities required for the project. All project personnel are furthermore directed that they are not permitted to enter Permit Required Confined Spaces (as defined by OSHA). For issues unrelated to contaminated materials, all non-AKRF employees are to be bound by all applicable OSHA regulations as well as any more stringent requirements specified by their employer in their corporate HASP or otherwise. AKRF is not responsible for providing oversight for issues unrelated to contaminated materials for non-employees. This oversight shall be the responsibility of the employer of that worker or other official designated by that employer.

2.0 HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 Hazard Evaluation

2.1.1 Hazards of Concern

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

2.1.2 Physical Characteristics

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

2.1.3 Hazardous Materials

Check all that apply					
Chemicals	**Solids**	**Sludges**	**Solvents**	**Oils**	**Other**
( ) Acids	( ) Ash	( ) Paints	(**X**) Halogens	( ) Transformer	(**X**) Lab
( ) Caustics	( ) Asbestos	( ) Metals	(**X**) Petroleum	( ) Other DF	( ) Pharm
( ) Pesticides	( ) Tailings	( ) POTW	( ) Other	( ) Motor or Hydraulic Oil	( ) Hospital
(**X**) Petroleum	(**X**) Other	( ) Other		( ) Gasoline	( ) Rad
( ) Inks	Historic fill material			(**X**) Fuel Oil	( ) MGP
( ) PCBs					( ) Mold
(**X**) Metals					( ) Cyanide
(**X**)Other: VOCs & SVOCs					

2.1.4 Chemicals of Concern

Chemical	REL/PEL/STEL	Health Hazards
Arsenic	REL C: 0.002 mg/m^3 PEL: 0.010 mg/m^3	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen].
Barium	REL = 0.5 mg/m^3 PEL = 0.5 mg/m^3	Gastrointestinal problems; muscular weakness; vomiting; abdominal cramps; diarrhea; hypertension; potential carcinogen.
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].
Beryllium	REL C: 0.0005 mg/m^3 PEL: 0.002 mg/m^3 PEL C: 0.005 mg/m^3; max peak: 0.025 mg/m^3	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen].
Cadmium	PEL: 0.005 mg/m^3	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen].
Chloroform	N STEL: 2 ppm PEL C: 50 ppm	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [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.
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).
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.
Manganese	REL: 1 mg/m^3 N STEL: 3 mg/m^3 PEL C: 5 mg/m^3	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage.
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.
Nickel	REL: 0.015 mg/m^3 PEL: 1 mg/m^3	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen].

Polycyclic Aromatic Hydrocarbons (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.
Silver	REL: 0.01 mg/m^3 PEL: 0.01 mg/m^3	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance.
Thallium	REL: 0.1 mg/m^3 PEL: 0.1 mg/m^3	Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs.
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.
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 ppm = parts per million mg/m^3 = milligrams per cubic meter IDLH = Immediately Dangerous to Life or Health		

2.2 Designated Personnel

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

2.3 Training

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

understand the potential hazards to health and safety. All field personnel must attend a training program, whose purpose is to:

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

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

2.4 Medical Surveillance Program

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

2.5 Site Work Zones

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

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

Task	Exclusion Zone	CRZ	Support Zone
Soil Borings	10 feet from drilling equipment	25 feet from drilling equipment	As Needed
Soil Excavation	15 feet from excavation border and excavation equipment or vehicles	15 feet from excavation border and excavation equipment or vehicles	As Needed
Comments: Control measures such as "caution tape" and/or traffic cones will be placed around the perimeter of the work area when work is being done in a public area.			

2.6 Air Monitoring

The purpose of the air monitoring program is to identify any exposure of the field personnel to potential environmental hazards associated with the documented soil and groundwater

contamination. Results of the air monitoring will be used to determine the appropriate response action, if needed.

2.6.1 Volatile Organic Compounds

A photoionization detector (PID) will be used to perform air monitoring during soil disturbance activities to determine airborne levels of total volatile organic compounds (VOCs). The PID will be calibrated at the start of the workday with a 100 parts per million (ppm) isobutylene standard.

2.6.2 Work Zone Air Monitoring

Real time air monitoring will be performed with the PID and Dust Trak. Measurements will be taken prior to commencement of work and continuously during the work. Measurements will be made as close to the workers as practicable and at the breathing height of the workers. The SSO shall set up the equipment and confirm that it is working properly. His/her 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 the background level for that day. The final measurement for the day will be performed after the end of work. The action levels and required responses are listed in the following table.

Instrument	Action Level	Response Action
PID	Less than 20 ppm in breathing zone	Level D or D-Modified
	Between 20 ppm and 50 ppm	Level C
	More than 50 ppm	Stop work. Resume work when readings are less than 50 ppm. Re-access Site conditions and response actions if elevated PID readings remain.
Dust Trak	Less than 0.25 mg/m^3 above background in breathing zone	Level D or D-Modified
	More than 0.25 mg/m^3 above background in breathing zone	Stop work. Resume work when readings are less than 1.25 mg/m^3.
mg/m^3 = milligrams per cubic meter ppm = parts per million		

2.6.3 Community Air Monitoring Plan

Community air monitoring will be conducted during all intrusive Site activities in compliance with the New York State Department of Health (NYSDOH) site-specific Community Air Monitoring Plan (CAMP). Real-time air monitoring for VOCs at the perimeter of the Exclusion Zone will be performed as described below.

VOC Monitoring

Periodic monitoring for VOCs will be conducted during non-intrusive activities such as the collection of groundwater samples. Periodic monitoring may include obtaining measurements upon arrival at a location, while opening a monitoring well cap, when bailing/purging a well, and upon leaving the location. In some instances, depending on the proximity of exposed individuals, continuous monitoring may be conducted during these activities.

Continuous monitoring for VOCs will be conducted during all ground intrusive activities (i.e., soil boring and monitoring well/soil gas point installation). VOC concentrations will

be measured in the work zone and at each selected monitoring station at the start of each workday, and periodically thereafter, to establish background concentrations.

Exclusion Zone Monitoring

VOCs will be monitored continuously within the Exclusion Zone. Monitoring will be conducted with a PID equipped with a 10.6 electron volt (eV) lamp capable of calculating 15-minute running average concentrations. The following actions will be taken based on organic vapor levels measured:

- If total organic vapor levels exceed 5 ppm above background for the 15-minute average at the Exclusion Zone perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total organic vapor levels at the perimeter of the Exclusion Zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less, but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average.
- If the total organic vapor level is above 25 ppm at the perimeter of the Exclusion Zone, activities will be shut down and the Major Vapor Emission Response Plan (described below) will be automatically implemented.

More frequent intervals of monitoring will be conducted if required as determined by the SSO. All 15-minute readings will be recorded and available for New York State Department of Environmental Conservation (NYSDEC) and NYSDOH personnel to review. Instantaneous readings, if any, will also be recorded.

Fixed Air Monitoring Stations

Fixed monitoring stations will be included outside of the Exclusion Zone. The fixed monitoring stations will be fully enclosed and equipped with the following:

- A PID equipped with a 10.6 eV lamp capable of calculating 15-minute running average VOC concentrations;
- A TSI 8530 DustTrak II or equivalent dust monitor capable of measuring the concentration of airborne respirable particulates less than 10 micrometers in size (PM10) and calculating 15-minute running average particulate concentrations; and
- A Netronix™ Thiamus™ ICU-820 or equivalent Global System for Mobile Communication (GSM)/Global Positioning System (GPS) device capable of recording air monitoring and location data.

All air monitoring data recorded at the fixed monitoring stations will be available for NYSDOH and/or NYSDEC review and will be included in the Interim Remedial Measures Construction Completion Report (IRMCCR).

If any organic levels greater than 1 ppm over background are identified at a fixed monitoring station, 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 1 ppm above background at a monitoring station, then the following contingency measures will be implemented:

- If total organic vapor levels exceed 1 ppm above background for the 15-minute average at the monitoring station, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 1 ppm above background, work activities will resume with continued monitoring.
- If total organic vapor levels at the perimeter of the Exclusion Zone persist at levels in excess of 1 ppm above background, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level at the monitoring station is below 1 ppm above background for the 15-minute average.
- If the total organic vapor level remains above 1 ppm at the monitoring station, activities will be shut down, and the Major Vapor Emission Response Plan (described below) will be automatically implemented.

Major Vapor Emission Response Plan

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

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

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

2.7 Personal Protective Equipment

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

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

Level of Protection & PPE		Soil Boring/Water Sampling
Level D (**X**) Steel Toe Shoes (**X**) Hard Hat (within 25 ft of drill rig) (**X**) Work Gloves	(**X**) Safety Glasses ( ) Face Shield (**X**) Ear Plugs (within 25 ft of drill rig) (**X**) Nitrile Gloves (**X**) Tyvek for drill operator if NAPL present	Yes

Level of Protection & PPE		Soil Boring/Water Sampling
Level C ***(in addition to Level D)***	( ) Particulate Cartridge	
(**X**) Half-Face Respirator OR	( ) Organic Cartridge	
(**X**) Full Face Respirator	(**X**) Dual Organic/ Particulate Cartridge	If PID > 20 ppm (breathing zone)
( ) Full-Face PAPR		
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breathe or any odors detected).		

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 upon leaving the work area and before eating, drinking, or any other such activity.
- Workers should shower as soon as possible after leaving the Site. Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat/cold stress.

3.0 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN

The field crew will be equipped with emergency equipment, such as a first aid kit and disposable eye washes. In the case of a medical emergency, the SSO will determine the nature of the emergency and he/she will have someone call for an ambulance, if needed. If the nature of the injury is not serious (i.e., the person can be moved without expert emergency medical personnel), he/she should be taken to a hospital by on-site personnel. Directions to the hospital are provided below, and a hospital route map is attached as Figure 1.

3.1 Hospital Directions

Hospital Name:	Montefiore Mount Vernon Hospital
Phone Number:	(914) 361-6040
Address/Location:	12 N 7th Avenue First Floor - Montefiore Mount Vernon Hospital Mount Vernon, NY 10550
Directions:	1. Exit the Site and turn RIGHT onto *Mt. Vernon Avenue* 2. Make a slight LEFT onto *Stevens Avenue* 3. Turn LEFT onto *Roosevelt Square W.* 4. Continue onto *N. 7th Avenue* 5. Turn LEFT into the Montefiore Mount Vernon Hospital parking lot. Note: The emergency entrance is clearly labeled and is located towards the back of the parking lot.

3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Rebecca Kinal	Remedial Engineer	914-922-2362 (office)
	Axel Schwendt	QA/QC Officer	646-388-9529 (office)
	Ashutosh Sharma	Project Manager	646-388-9865 (office)
	Tim Larigan	Deputy Project Manager	646-388-9508 (office)
	Chad Walters	SSO	646-388-9752 (office) 929-428-2998 (cell)
MacQuesten Station Takeover LLC	Joe Apicella	Executive Vice President	914-667-7227
Ambulance, Fire Department & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	800-457-7362

4.0 APPROVAL & ACKNOWLEDGMENTS OF HASP

APPROVAL

Signed: _____ Date: _____

AKRF Project Manager

Signed: _____ Date: _____

AKRF 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.

AFFIDAVIT

I,_____(name), of_____(company name), have read the Health and Safety Plan (HASP) for the 20 South West Street Silversmith Site. 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: _____
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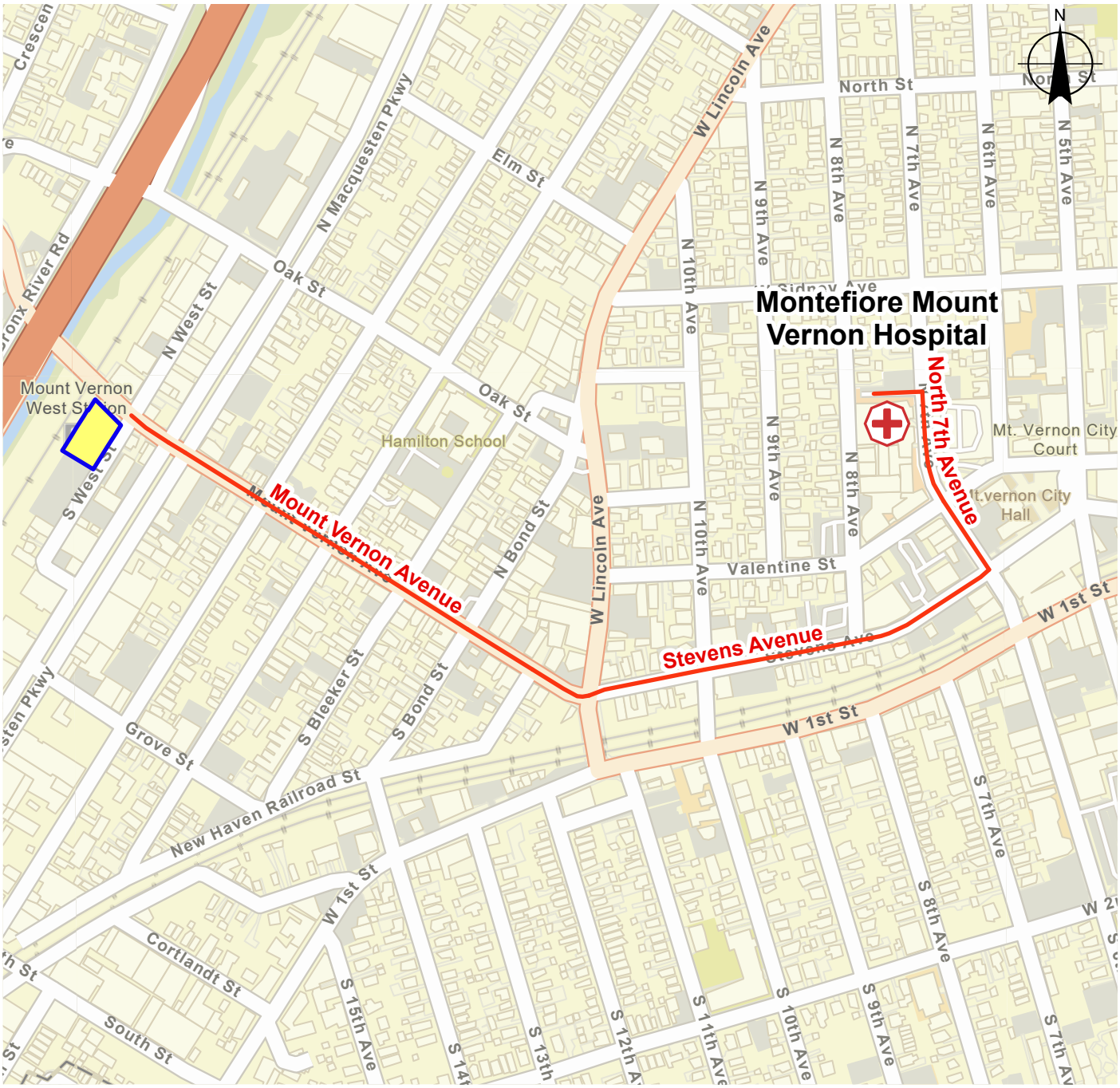
FIGURE 1
HOSPITAL ROUTE MAP



Service Layer Credits: ESRI World Street Map 2024

LEGEND

- PROJECT SITE BOUNDARY
- ROUTE TO HOSPITAL
- HOSPITAL LOCATION

Montefiore Mount Vernon Hospital
12 N 7th Avenue
First Floor - Montefiore Mount Vernon Hospital
Mount Vernon, NY 10550
(914) 361-6040

0 500 1,000
SCALE IN FEET

akrf
440 Park Avenue South, New York, NY 10016

20 South West Street Silversmith Site
20 South West Street
Mount Vernon, NY

HOSPITAL ROUTE MAP

DATE **5/23/2025**
PROJECT NO. **250566**
FIGURE **1**

APPENDIX A
POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ARSENIC
CAS # 7440-38-2

Division of Toxicology ToxFAQs™ December 2003

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. 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 higher than average levels of arsenic occurs mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found at 1,014 of the 1,598 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

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

Inorganic arsenic compounds are mainly used to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants.

What happens to arsenic when it enters the environment?

❑ Arsenic cannot be destroyed in the environment. It can only change its form.
❑ Arsenic in air will settle to the ground or is washed out of the air by rain.
❑ Many arsenic compounds can dissolve in water.
❑ Fish and shellfish can accumulate arsenic, but the arsenic in fish is mostly in a form that is not harmful.

How might I be exposed to arsenic?

❑ Eating food, drinking water, or breathing air containing arsenic.
❑ Breathing contaminated workplace air.
❑ Breathing sawdust or burning smoke from wood treated with arsenic.
❑ Living near uncontrolled hazardous waste sites containing arsenic.
❑ Living in areas with unusually high natural levels of arsenic in rock.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the

appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as inorganic arsenic.

How likely is arsenic to cause cancer?

Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the Department of Health and Human Services (DHHS), and the EPA have determined that inorganic arsenic is a human carcinogen.

How can arsenic affect children?

We do not know if exposure to arsenic will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to inorganic arsenic.

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

How can families reduce the risk of exposure to arsenic?

❑ If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
❑ If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

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

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

Has the federal government made recommendations to protect human health?

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

The Occupational Safety and Health Administration has set limits of 10 μg arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Arsenic. 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.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

BARIUM AND COMPOUNDS

CAS # 7440-39-3

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

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

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

What is barium?

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

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

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

What happens to barium when it enters the environment?

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

How might I be exposed to barium?

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

How can barium affect my health?

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

BARIUM AND COMPOUNDS
CAS # 7440-39-3

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

How likely is barium to cause cancer?

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

How can barium affect children?

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

How can families reduce the risks of exposure to barium?

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

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

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

The geometric mean barium level measured in the U.S. general population aged 6 and older is reported by the Centers for Disease Control and Prevention (CDC) as 1.44 μg/g creatinine (measured in urine).

Has the federal government made recommendations to protect human health?

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

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

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

References

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

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

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

BENZENE
CAS # 71-43-2

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.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

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.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

BERYLLIUM

CAS #7440-41-7

Division of Toxicology ToxFAQs™ **September 2002**

This fact sheet answers the most frequently asked health questions (FAQs) about beryllium. 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: People working or living near beryllium industries have the greatest potential for exposure to beryllium. Lung damage has been observed in people exposed to high levels of beryllium in the air. About 1-15% of all people occupationally-exposed to beryllium in air become sensitive to beryllium and may develop chronic beryllium disease (CBD), an irreversible and sometimes fatal scarring of the lungs. CBD may be completely asymptomatic or begin with coughing, chest pain, shortness of breath, weakness, and/or fatigue. Beryllium has been found in at least 535 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is beryllium?

Beryllium is a hard, grayish metal naturally found in mineral rocks, coal, soil, and volcanic dust. Beryllium ore is mined, and the beryllium is purified for use in nuclear weapons and reactors, aircraft and space vehicle structures, instruments, x-ray machines, and mirrors. Beryllium oxide is used to make speciality ceramics for electrical and high-technology applications. Beryllium alloys are used in automobiles, computers, sports equipment (golf clubs), and dental bridges.

What happens to beryllium when it enters the environment?

❑ Beryllium dust enters the air from burning coal and oil. This beryllium dust will eventually settle over the land and water.
❑ It enters water from erosion of rocks and soil, and from industrial waste. Some beryllium compounds will dissolve in water, but most stick to particles and settle to the bottom.
❑ Most beryllium in soil does not dissolve in water and remains bound to soil.
❑ Beryllium does not accumulate in the food chain.

How might I be exposed to beryllium?

❑ The general population is normally exposed to low levels of beryllium in air, food, and water.
❑ People working in industries where beryllium is mined, processed, machined, or converted into metal, alloys, and other chemicals may be exposed to high levels of beryllium. People living near these industries may also be exposed to higher than normal levels of beryllium in air.
❑ People living near uncontrolled hazardous waste sites may be exposed to higher than normal levels of beryllium.

How can beryllium affect my health?

Beryllium can be harmful if you breathe it. The effects depend on how much you are exposed to, for how long, and individual susceptibility. If beryllium air levels are high enough (greater than 1000 ug/m^3), an acute condition can result. This condition resembles pneumonia and is called acute beryllium disease Occupational and community air standards are effective in preventing acute lung damage.

Some exposed workers (1-15%) become sensitive to beryllium. These individuals may develop an inflammatory reaction in the respiratory system. This condition is called chronic beryllium disease (CBD), and can occur years after exposure to higher than normal levels of beryllium (greater than 0.2 ug/m^3). This disease can make you feel weak and tired, and can cause difficulty in breathing. It can also result in anorexia, weight loss, and may also lead to right side heart

enlargement and heart disease in advanced cases. Some people who are sensitized to beryllium may not have any symptoms. The general population is unlikely to develop chronic beryllium disease because ambient air levels of beryllium are normally very low (0.00003-0.0002 ug/m^3).

Swallowing beryllium has not been reported to cause effects in humans because very little beryllium is absorbed from the stomach and intestines. Ulcers have been seen in dogs ingesting beryllium in the diet. Beryllium contact with skin that has been scraped or cut may cause rashes or ulcers.

How likely is beryllium to cause cancer?

Long term exposure to beryllium can increase the risk of developing lung cancer in people.

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have determined that beryllium is a human carcinogen. The EPA has determined that beryllium is a probable human carcinogen. EPA has estimated that lifetime exposure to 0.04 ug/m^3 beryllium can result in a one in a thousand chance of developing cancer.

How can beryllium affect children?

It is likely that the health effects seen in children exposed to beryllium will be similar to the effects seen in adults. We do not know whether children differ from adults in their susceptibility to beryllium.

We do not know if exposure to beryllium will result in birth defects or other developmental effects in people. The studies on developmental effects in animals are not conclusive.

How can families reduce the risk of exposure to beryllium?

❑ Individuals working at facilities that use beryllium should make sure that contaminated clothing and objects are not brought home.

❑ Children should avoid playing in soils near uncontrolled hazardous waste sites where beryllium may have been discarded.

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

Beryllium can be measured in samples from your blood, urine, skin, or lungs. These tests are rarely done because they are not reliable measures of your exposure over time. Also, these tests do not show if you have become sensitized to beryllium.

Another test, the beryllium lymphocyte proliferation test (BeLPT), can help your doctor decide if you are sensitized to beryllium. This test is only done in a few specialized laboratories, but doctors familiar with the test can collect blood samples and send them for testing by overnight carrier. The BeLPT is most often done for people who work with beryllium. It is also useful for separating chronic beryllium disease from diagnoses that resemble it (for example, sarcoidosis). Depending on your exposure history, clinical findings, and test results, your doctor may also recommend additional specialized testing.

Has the federal government made recommendations to protect human health?

The EPA restricts the amount of beryllium that industries may release into the air to 0.01 ug/m^3, averaged over a 30-day period.

The Occupational Safety and Health Administration (OSHA) sets a limit of 2 ug/m^3 for an 8-hour work shift measured as a personal sample.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Beryllium 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.

Cadmium- ToxFAQs™

CAS # 7440-43-9

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

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

What is cadmium?

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

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

What happens to cadmium when it enters the environment?

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

How might I be exposed to cadmium?

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

How can cadmium affect my health?

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

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

How likely is cadmium to cause cancer?

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

Cadmium

CAS # 7440-43-9

How can cadmium affect children?

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

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

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

How can families reduce the risk of exposure to cadmium?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

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

References

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

Where can I get more information?

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

Phone: 1-800-232-4636

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

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

CHLOROFORM
CAS # 67-66-3

This fact sheet answers the most frequently asked health questions (FAQs) about chloroform. 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 chloroform can occur when breathing contaminated air or when drinking or touching the substance or water containing it. Breathing chloroform can cause dizziness, fatigue, and headaches. Breathing chloroform or ingesting chloroform over long periods of time may damage your liver and kidneys. It can cause sores if large amounts touch your skin. This substance has been found in at least 717 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is chloroform?

(Pronounced klôr′ə-fôrm′)

Chloroform is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. It will burn only when it reaches very high temperatures.

In the past, chloroform was used as an inhaled anesthetic during surgery, but it isn't used that way today. Today, chloroform is used to make other chemicals and can also be formed in small amounts when chlorine is added to water.

Other names for chloroform are trichloromethane and methyl trichloride.

What happens to chloroform when it enters the environment?

- Chloroform evaporates easily into the air.
- Most of the chloroform in air breaks down eventually, but it is a slow process.
- The breakdown products in air include phosgene and hydrogen chloride, which are both toxic.
- It doesn't stick to soil very well and can travel through soil to groundwater.
- Chloroform dissolves easily in water and some of it may break down to other chemicals.
- Chloroform lasts a long time in groundwater.
- Chloroform doesn't appear to build up in great amounts in plants and animals.

How might I be exposed to chloroform?

- Drinking water or beverages made using water containing chloroform.
- Breathing indoor or outdoor air containing it, especially in the workplace.
- Eating food that contains it.
- Skin contact with chloroform or water that contains it, such as in swimming pools.

How can chloroform affect my health?

Breathing about 900 parts of chloroform per million parts air (900 ppm) for a short time can cause dizziness, fatigue, and headache. Breathing air, eating food, or drinking water containing high levels of chloroform for long periods of time may damage your liver and kidneys. Large amounts of chloroform can cause sores when chloroform touches your skin.

It isn't known whether chloroform causes reproductive effects or birth defects in people.

Animal studies have shown that miscarriages occurred in rats and mice that breathed air containing 30 to 300 ppm chloroform during pregnancy and also in rats that ate chloroform during pregnancy. Offspring of rats and mice that breathed chloroform during pregnancy had birth defects. Abnormal sperm were found in mice that breathed air containing 400 ppm chloroform for a few days.

How likely is chloroform to cause cancer?

The Department of Health and Human Services (DHHS) has determined that chloroform may reasonably be anticipated to be a carcinogen.

Rats and mice that ate food or drank water with chloroform developed cancer of the liver and kidneys.

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

Although the amounts of chloroform in the air that you exhale and in blood, urine, and body tissues can be measured, there is no reliable test to determine how much chloroform you have been exposed to or whether you will experience any harmful effects.

The measurement of chloroform in body fluids and tissues may help to determine if you have come into contact with large amounts of chloroform, but these tests are useful for only a short time after you are exposed. Chloroform in your body might also indicate that you have come into contact with other chemicals.

Has the federal government made recommendations to protect human health?

The EPA drinking water limit for total trihalomethanes, a class of chemicals that includes chloroform, is 100 micrograms per liter of water (100 μg/L).

The EPA requires that spills or accidental releases of 10 pounds or more of chloroform into the environment be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set the maximum allowable concentration of chloroform in workroom air during an 8-hour workday in a 40-hour workweek at 50 ppm.

Glossary

Carcinogenicity: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Ingesting: Taking food or drink into your body.

Microgram (μg): One millionth of a gram.

Miscarriage: Pregnancy loss.

ppm: Parts per million.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Chloroform (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

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 environmenta l quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

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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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

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.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

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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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

FUEL OILS

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

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

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

What are fuel oils?

(Pronounced fyo͞o′əl oilz)

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

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

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

What happens to fuel oils when they enter the environment?

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

How might I be exposed to fuel oils?

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

How can fuel oils affect my health?

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

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

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

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

How likely are fuel oils to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

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

References

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

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

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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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MANGANESE

CAS # 7439-96-5

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

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

What is manganese?

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

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

What happens to manganese when it enters the environment?

❑ Manganese can be released to the air, soil, and water from the manufacture, use, and disposal of manganese-based products.

❑ Manganese cannot break down in the environment. It can only change its form or become attached to or separated from particles.

❑ In water, manganese tends to attach to particles in the water or settle into the sediment.

❑ The chemical state of manganese and the type of soil determine how fast it moves through the soil and how much is retained in the soil.

❑ The manganese-containing gasoline additive may degrade in the environment quickly when exposed to sunlight, releasing manganese.

How might I be exposed to manganese?

❑ The primary way you can be exposed to manganese is by eating food or manganese-containing nutritional supplements. Vegetarians who consume foods rich in manganese such as grains, beans and nuts, as well as heavy tea drinkers, may have a higher intake of manganese than the average person.

❑ Certain occupations like welding or working in a factory where steel is made may increase your chances of being exposed to high levels of manganese.

❑ Manganese is routinely contained in groundwater, drinking water, and soil at low levels. Drinking water containing manganese or swimming or bathing in water containing manganese may expose you to low levels of this chemical.

How can manganese affect my health?

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

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

some workers exposed to lower concentrations in the work place.

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

How likely is manganese to cause cancer?

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

How can manganese affect children?

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

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

How can families reduce the risks of exposure to manganese?

❏ Children are not likely to be exposed to harmful amounts of manganese in the diet. However, higher-than-usual amounts of manganese may be absorbed if their diet is low in iron. It is important to provide your child with a well-balanced diet.

❏ Workers exposed to high levels of airborne manganese in certain occupational settings may accumulate manganese dust on their work clothes. Manganese-contaminated work clothing should be removed before getting into your car or entering your home to help reduce the exposure hazard for yourself and your family.

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

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

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

Has the federal government made recommendations to protect human health?

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

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

The FDA has determined that the manganese concentration in bottled drinking water should not exceed 0.05 mg/L.

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

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Manganese (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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MERCURY
CAS # 7439-97-6

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 mŭr′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.

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NICKEL

CAS # 7440-02-0

Division of Toxicology ToxFAQs™ **August 2005**

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

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

What is nickel?

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

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

What happens to nickel when it enters the environment?

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

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

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

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

How might I be exposed to nickel?

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

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

❏ By drinking water that contains small amounts of nickel.

❏ By breathing air or smoking tobacco containing nickel.

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

How can nickel affect my health?

The most common harmful health effect of nickel in humans is an allergic reaction. Approximately 10-20% of the population is sensitive to nickel. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin for a long time. Once a person is sensitized to nickel, further contact with the metal may produce a reaction. The most common reaction is a skin rash at the site of contact. The skin rash may also

occur at a site away from the site of contact. Less frequently, some people who are sensitive to nickel have asthma attacks following exposure to nickel. Some sensitized people react when they consume food or water containing nickel or breathe dust containing it.

People working in nickel refineries or nickel-processing plants have experienced chronic bronchitis and reduced lung function. These persons breathed amounts of nickel much higher than levels found normally in the environment.

Workers who drank water containing high amounts of nickel had stomach ache and suffered adverse effects to their blood and kidneys.

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

How likely is nickel to cause cancer?

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

How can nickel affect children?

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

How can families reduce the risks of exposure to nickel?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

References

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

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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.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

- 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.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

SILVER
CAS # 7440-22-4

This fact sheet answers the most frequently asked health questions (FAQs) about silver. 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: Silver is an element found naturally in the environment. At very high levels, it may cause argyria, a blue-gray discoloration of the skin and other organs. This chemical has been found in at least 27 of the 1,177 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is silver?

(Pronounced sĭl′vər)

Silver is a naturally occurring element. It is found in the environment combined with other elements such as sulfide, chloride, and nitrate. Pure silver is "silver" colored, but silver nitrate and silver chloride are powdery white and silver sulfide and silver oxide are dark-gray to black. Silver is often found as a by-product during the retrieval of copper, lead, zinc, and gold ores.

Silver is used to make jewelry, silverware, electronic equipment, and dental fillings. It is also used to make photographs, in brazing alloys and solders, to disinfect drinking water and water in swimming pools, and as an antibacterial agent. Silver has also been used in lozenges and chewing gum to help people stop smoking.

What happens to silver when is enters the environment?

- Silver may be released into the air and water through natural processes such as the weathering of rocks.
- Human activities such as the processing of ores, cement manufacture, and the burning of fossil fuel may release silver into the air.
- It may be released into water from photographic processing.
- Rain may wash silver out of soil into the groundwater.
- Silver does not appear to concentrate to a significant extent in aquatic animals.

How might I be exposed to silver?

- Breathing low levels in air.
- Swallowing it in food or drinking water.
- Carrying out activities such as jewelry-making, soldering, and photography.
- Using anti-smoking lozenges or other medicines containing it.

How can silver affect my health?

Exposure to high levels of silver for a long period of time may result in a condition called arygria, a blue-gray discoloration of the skin and other body tissues. Lower-level exposures to silver may also cause silver to be deposited in the skin and other parts of the body; however, this is not known to be harmful. Argyria is a permanent effect, but it appears to be a cosmetic problem that may not be otherwise harmful to health.

ToxFAQs Internet home page via WWW is http://www.atsdr.cdc.gov/toxfaq.html

Exposure to high levels of silver in the air has resulted in breathing problems, lung and throat irritation, and stomach pains. Skin contact with silver can cause mild allergic reactions such as rash, swelling, and inflammation in some people.

Animal studies have shown that swallowing silver results in the deposit of silver in the skin. One study in mice found that the animals exposed to silver in drinking water were less active than unexposed animals.

No studies are available on whether silver affects reproduction or causes developmental problems in people.

How likely is silver to cause cancer?

No studies are available on whether silver may cause cancer in people. The only available animal studies showed both positive and negative results when silver was implanted under the skin.

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

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

Silver can be measured in the blood, urine, feces, and body tissues of exposed people. Silver builds up in the body, and the best way to learn if past exposure has occurred is to look for silver in samples of skin. Tests for silver are not commonly done at a doctor's office because they require special equipment. Although doctors can find out if a person has been exposed to silver by doing these tests, they cannot tell whether any health effects will occur.

Has the federal government made recommendations to protect human health?

The EPA recommends that the concentration of silver in drinking water not exceed 0.10 milligrams per liter of water (0.10 mg/L) because of the skin discoloration that may occur.

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

The Occupational Safety and Health Administration (OSHA) limits silver in workplace air to 0.01 milligrams per cubic meter (0.01 mg/m^3) for an 8-hour workday, 40-hour workweek. The National Institute of Occupational Safety and Health (NIOSH) also recommends that workplace air contain no more that 0.01 mg/m^3 silver.

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends that workplace air contain no more than 0.1 mg/m^3 silver metal and 0.01 mg/m^3 soluble silver compounds.

The federal recommendations have been updated as of July 1999.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemcial Abstracts Service.

Milligram (mg): One thousandth of a gram.

National Priorities List: A list of the nation's worst hazardous waste sites.

Soluble: Capable of being dissolved in water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological profile for silver. 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.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

THALLIUM
CAS # 7440-28-0

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1995**

This fact sheet answers the most frequently asked health questions (FAQs) about thallium. 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 thallium occurs mainly from eating food. Exposure to higher levels of thallium may occur in the workplace. Breathing high levels of thallium may result in effects on the nervous system, while ingesting high levels of it results in vomiting, diarrhea, temporary hair loss, and other effects. This chemical has been found in at least 210 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is thallium?

(Pronounced thăl′ē-əm)

Pure thallium is a bluish-white metal that is found in trace amounts in the earth's crust. In the past, thallium was obtained as a by-product from smelting other metals; however, it has not been produced in the United States since 1984. Currently, all the thallium is obtained from imports and from thallium reserves.

In its pure form, thallium is odorless and tasteless. It can also be found combined with other substances such as bromine, chlorine, fluorine, and iodine. When it's combined, it appears colorless-to-white or yellow.

Thallium is used mostly in manufacturing electronic devices, switches, and closures, primarily for the semiconductor industry. It also has limited use in the manufacture of special glass and for certain medical procedures.

What happens to thallium when it enters the environment?

- Thallium enters the environment primarily from coal-burning and smelting, in which it is a trace contaminant of the raw materials.
- It stays in the air, water, and soil for a long time and is not broken down.
- Some thallium compounds are removed from the atmosphere in rain and snow.
- It's absorbed by plants and enters the food chain.
- It builds up in fish and shellfish.

How might I be exposed to thallium?

- Eating food contaminated with thallium may be a major source of exposure for most people.
- Breathing workplace air in industries that use thallium
- Smoking cigarettes.
- Living near hazardous waste sites containing thallium (may result in higher than normal exposures).
- Touching or, for children, eating soil contaminated with thallium.
- Breathing low levels in air and water.

How can thallium affect my health?

Exposure to high levels of thallium can result in harmful health effects. A study on workers exposed on the job over several years reported nervous system effects, such as numbness of fingers and toes, from breathing thallium.

Studies in people who ingested large amounts of thallium over a short time have reported vomiting, diarrhea, temporary hair loss, and effects on the nervous system, lungs, heart, liver,

and kidneys. It has caused death. It is not known what the effects are from ingesting low levels of thallium over a long time.

Birth defects were not reported in the children of mothers exposed to low levels from eating vegetables and fruits contaminated with thallium. Studies in rats, however, exposed to high levels of thallium, showed adverse developmental effects.

It is not known if breathing or ingesting thallium affects human reproduction. Studies showed that rats that ingested thallium for several weeks had some adverse reproductive effects. Animal data suggest that the male reproductive system may be susceptible to damage by low levels of thallium.

There is no information available on the health effects of skin contact with thallium in people or animals.

How likely is thallium to cause cancer?

The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency (EPA) have not classified thallium as to its human carcinogenicity.

No studies are available in people or animals on the carcinogenic effects of breathing, ingesting, or touching thallium.

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

There are medical tests available to measure levels of thallium in urine and hair. In addition, thallium can also be measured in blood; however, this is not a good indicator of exposure since thallium only stays in blood a very short time.

These tests require special equipment that is not usually available in most doctor's offices. In addition, these tests cannot determine if adverse health effects will occur from the exposure to thallium.

Has the federal government made recommendations to protect human health?

The EPA requires that discharges or accidental spills into the environment of 1,000 pounds or more of thallium be reported.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 0.1 milligrams per cubic meter (0.1 mg/m^3) for thallium in workplace air. The American Conference of Governmental Industrial Hygienists (ACGIH) has established the same guidelines as OSHA for the workplace.

The National Institute for Occupational Safety and Health (NIOSH) has recommended that 15 mg/m^3 of thallium be considered immediately dangerous to life and health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Carcinogenicity: Ability to cause cancer.

Ingesting: Taking food or drink into your body.

Milligram (mg): One thousandth of a gram.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological profile for thallium. 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.

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.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

XYLENE
CAS # 1330-20-7

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 AND DISEASE REGISTRY

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.

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

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_____

_____

WITNESS TO ACCIDENT/INCIDENT:

Name:	_____	Company:	_____
Address:	_____	Address:	_____
Phone No.:	_____	Phone No.:	_____
Name:	_____	Company:	_____
Address:	_____	Address:	_____
Phone No.:	_____	Phone No.:	_____

INJURED - ILL:

Name: _____ SSN: _____

Address: _____ Age: _____

Length of Service: _____ Time on Present Job: _____

Time/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

____ Disabling ___ Non-disabling ___ Fatality

____ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: _____

NATURE OF INJURY OR ILLNESS: _____

_____

_____

_____

CLASSIFICATION OF INJURY:

__ Abrasions _____ Dislocations ____ Punctures

__ Bites _____ Faint/Dizziness ____ Radiation Burns

__ Blisters _____ Fractures ____ Respiratory Allergy

__ Bruises _____ Frostbite ____ Sprains

__ Chemical Burns _____ Heat Burns ____ Toxic Resp. Exposure

__ Cold Exposure _____ Heat Exhaustion ____ Toxic Ingestion

__ Concussion _____ Heat Stroke ____ Dermal Allergy

__ Lacerations

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

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

PROPERTY DAMAGE:

Description of Damage: _____

_____

Cost of Damage: $ _____

ACCIDENT/INCIDENT LOCATION: _____

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

_____

_____

_____

_____

Was weather a factor?:_____

_____

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

_____

_____

_____

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

_____

_____

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

_____

_____

Modifications:

_____

Was injured using required equipment?:

_____

_____

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

_____

_____

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

_____

_____

_____

_____

_____

ACCIDENT/INCIDENT REPORT REVIEWED BY:

_____ _____

SSO Name Printed SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

_____ _____

Signature Title

_____ _____

Signature Title

_____ _____

Signature Title

ACCIDENT/INCIDENT FOLLOW-UP: Date: _____

Outcome of accident/incident: _____

_____

_____

_____

Physician's recommendations: _____

_____

_____

_____

Date injured returned to work: _____

Follow-up performed by:

_____ _____

Signature Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

APPENDIX 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

APPENDIX B

COMMUNITY AIR MONITORING PLAN

20 SOUTH WEST STREET SILVERSMITH SITE

20 SOUTH WEST STREET
MOUNT VERNON, NEW YORK

Community Air Monitoring Plan

BCP Site No.: C360259
AKRF Project Number: 250566

Prepared for:

MacQuesten Station Takeover LLC
438 Fifth Avenue, Suite 100
Pelham, NY 10803

Prepared by:

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

JANUARY 2026, REVISED MAY 2026

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IN-TEXT TABLES

1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) has been developed for use during the implementation of the Interim Remedial Measures (IRM) Work Plan (IRMWP) activities conducted by all on-site personnel, both AKRF employees and others, at the 20 South West Street Silversmith site, located at 20 South West Street in Mount Vernon, Westchester County, New York (the Site), also identified as Tax Parcel ID 164.67-1057-16. The Site consists of a two-story commercial building occupied by a 7-Eleven convenience store and several other small commercial businesses, and a single-story structure that operates as a temporary station for the Mount Vernon Fire Department. The buildings are situated in the northern and western portions of the Site surrounded by exterior asphalt-paved areas. A Site Location map is provided as Figure 1.

Available records have documented that the property was historically developed with commercial uses, including a silversmith plating facility from approximately 1961 to 2017 and an environmental laboratory from 1978 to 1992. Based on investigations conducted to date, identified contamination at the Site includes volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and metals in soil; VOCs, semi-volatile organic compounds (SVOCs), and metals in groundwater; and VOCs in soil vapor. .

2.0 COMMUNITY AIR MONITORING PROGRAM

The purpose of the Community Air Monitoring Plan (CAMP) is to outline appropriate monitoring, mitigation measures, and reporting requirements to ensure that the surrounding community is not affected during implementation of the Interim Remedial Measures (IRM) field activities. Community air monitoring will be conducted during all intrusive Site activities in compliance with the New York State Department of Health (NYSDOH) Generic CAMP. 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 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. Real-time air monitoring for volatile organic compounds (VOCs) and particulates at the perimeter of the exclusion zone will be performed as described below.

2.1 Volatile Organic Compounds and Particulates

Continuous monitoring for VOCs will be conducted during all ground intrusive activities, including soil boring advancement, and excavation. 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 a 10.6 electron volt (eV) lamp capable of calculating 15-minute running average concentrations and equipped with an audible alarm to indicate exceedances of action levels. An inspection of the monitoring stations will be conducted on at least an hourly basis. All 15-minute average PID readings will be recorded and available for NYSDEC and NYSDOH personnel to review. The action levels and their respective required responses are summarized in Table 1, below.

Continuous monitoring for particulates will be conducted during all ground intrusive activities, which will involve the measurement of respirable dust. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. Particulates will be monitored continuously at the downwind perimeter of the exclusion zone. Community air monitoring for dust particulates will be conducted using a DustTrak® or equivalent to measure the concentration of airborne respirable particulates less than 10 micrometers in size (PM_{10}). The dust monitor will be capable of calculating 15-minute running average concentrations and equipped with an audible alarm to indicate the exceedance of action levels. An inspection of the monitoring stations will be conducted on at least an hourly basis. All 15-minute average readings will be recorded and available for NYSDEC and NYSDOH personnel to review.

The action levels and their respective required responses are summarized in Table 1, below.

2.2 Action Levels and Required Actions

The action levels and required responses are listed in Table 1:

Table 1
Action Levels and Required Response Actions

Monitoring	Action Level[1]	Response Action
Particulates	15-minute average between 0.100 mg/m^3 and 0.150 mg/m^3 above background	Implement dust suppression measures and continue monitoring. Work may continue if levels remain below 0.150 mg/m^3 and no visible dust is migrating from the work area.
	15-minute average greater than 0.150 mg/m^3 above background	Stop work until dust suppression measures mitigate levels to below 0.150 mg/m^3.
VOCs	15-minute average between 5 and 25 ppm	Stop work, identify source of vapors and mitigate. Work may continue if instantons readings rapidly decrease below 5 ppm above background.
	15-minute average more than 25 ppm	Shutdown of work. Mitigate levels to below 5 ppm.

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

2.3 Special Requirements for Work Within 20 ft of Potentially Exposed Individuals or Structures

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 µg/m^3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 µg/m^3 or less at the monitoring point.

Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

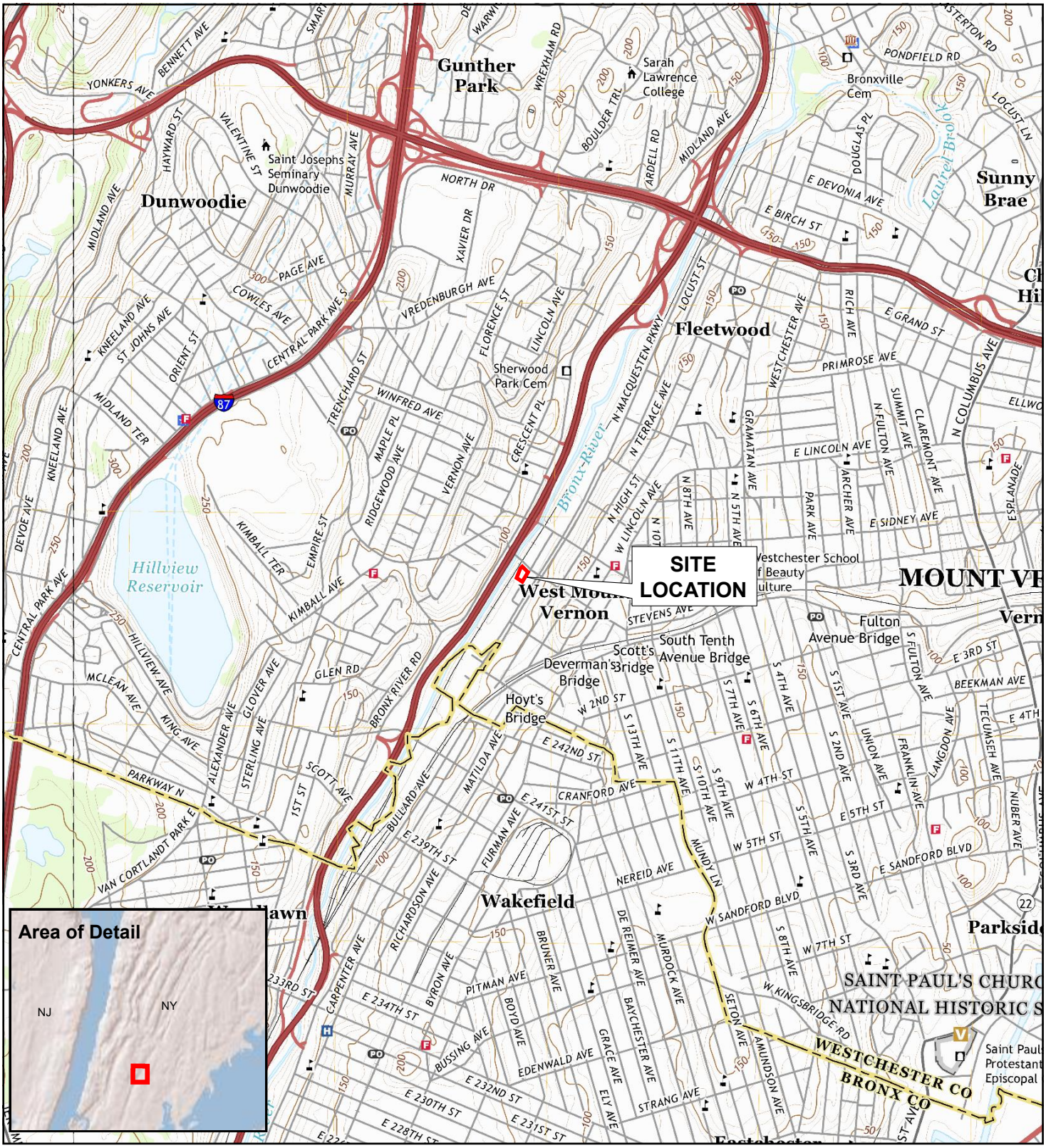
2.4 Special Requirements for Indoor Work With Co-Located Residences or Facilities

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" except that in this instance "nearby/occupied structures" would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.

2.5 Reporting

CAMP summary reports will be prepared and submitted to NYSDEC and NYSDOH for review as part of the daily and monthly reports. In the event that there is an action level exceedance or complaint, NYSDEC and NYSDOH will be notified within 24 hours (same day to the extent possible). The notification will include a description of the exceedance or complaint, the cause of the exceedance or complaint, and any corrective actions taken. All recorded CAMP data will be included in the Interim Remedial Measures Construction Completion Report (IRMCCR).

FIGURE



akrf
440 Park Avenue South, New York, NY 10016

20 South West Street
Mount Vernon, NY

SITE LOCATION

DATE
5/22/2025

PROJECT NO.
250566

FIGURE
1

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

20 SOUTH WEST STREET SILVERSMITH SITE

20 SOUTH WEST STREET
MOUNT VERNON, NEW YORK

Quality Assurance Project Plan

BCP Site No.: C360259
AKRF Project Number: 250566

Prepared for:

MacQuesten Station Takeover LLC
438 Fifth Avenue, Suite 100
Pelham, NY 10803

Prepared by:

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

JANUARY 2026, REVISED MAY 2026

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INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of the Interim Remedial Measures (IRM) Work Plan (IRMWP), at the 20 South West Street Silversmith site located at 20 South West Street in Mount Vernon, Westchester County, New York (the Site), also identified as Tax Parcel ID 164.67-1057-16. The Site currently consists of a two-story commercial building occupied by a 7-Eleven convenience store and several other small commercial businesses, and a single-story structure that operates as a temporary station for the Mount Vernon Fire Department. The building is situated on the northern and western portions of the Site, and surrounded by asphalt-paved outdoor areas. A Site Location Plan is provided as Figure 1 in the IRMWP.

The objective of this QAPP is to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental investigative, sampling, and remedial activities conducted under the New York State Department of Environmental Conservation (NYSDEC) oversight in the Brownfield Cleanup Program (BCP) (BCP Site No. C360259). Adherence to the QAPP will ensure that defensible data will be obtained during all environmental work at the Site.

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 Code of Federal Regulations (CFR) Part 1910. The following sections describe the key project personnel and their responsibilities.

1.1 Remedial Engineer

The remedial engineer will be responsible for oversight of the design of all Institutional Controls (ICs) and Engineering Controls (ECs) at the Site. Rebecca Kinal will serve as the remedial engineer for the IRMWP. Ms. Kinal's resume is included in Attachment A.

1.2 Quality Assurance/ Quality Control Officer

Axel Schwendt will serve as the QA/QC officer and will be responsible for adherence to the QAPP. The QA/QC officer will review the procedures with all personnel prior to commencing any fieldwork and will conduct periodic Site visits to assess implementation of the procedures. Mr. Schwendt's resume is included in Attachment A.

1.3 Project Manager

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

1.4 Deputy Project Manager

Tim Larigan will serve as the deputy project manager for the IRMWP. The deputy project manager will be responsible for assisting the project manager. The deputy project manager will help manage tasks and prepare reports and will participate in meetings with the Site owner/Volunteer and/or the NYSDEC. Mr. Larigan's resume is included in Attachment A.

1.5 Site Safety Officer

The SSO 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 B of the IRMWP. They will report to the project manager or alternate project manager on a regular basis regarding daily progress and any deviations from the work plan. The SSO will be a qualified and responsible person able to act professionally and promptly during environmental work at the Site. Chad Walters will act as the SSO. Mr. Walters' resume is included in Attachment A.

1.6 Laboratory 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 Armbruster of Eurofins Environmental Testing Laboratories (Eurofins), a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)-certified laboratory being employed for all environmental sampling at the Site. Mr. Armbruster's resume is included in Attachment A.

1.7 Laboratory Data Validator

The laboratory data validator will be responsible for third party data validation and preparation of DUSRs. The third-party laboratory data validator will be Lori Beyer of L.A.B. Validation Corp. Ms. Beyer's resume is included in Attachment A.

STANDARD OPERATING PROCEDURES

The following sections describe the standard operating procedures (SOPs) for the investigation activities included in the IRMWP. During these operations, safety monitoring will be performed as described in the HASP, included as Appendix B of the IRMWP.

1.8 Waste Characterization Sampling

Waste characterization samples will be collected following building demolition and prior to initiating any excavation. A Geoprobe® direct-push probe (DPP) drill rig will be used to advance the soil borings. Soil cores will be collected using stainless steel macrocore piston rod samplers fitted with internal acetate liners. Soil samples will be inspected and logged by AKRF field personnel, as described in Section 1.8.1. All sampling equipment (e.g., drilling rods and casings, macro core samplers, and probe rods) will be either dedicated or decontaminated between sampling locations in accordance with Section 1.11 of this document.

Soil samples slated for laboratory analysis will be labeled, placed in laboratory-supplied containers, and shipped to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory via courier with appropriate chain of custody documentation in accordance with EPA protocols. The samples will be analyzed in accordance with the requirements of the facilities being considered for off-site disposal of the contaminated Site soil/fill. All investigation derived waste (IDW) associated with the drilling of soil borings will be managed as described in Section 1.12.

Based on these sampling results, one or more appropriately permitted waste disposal facilities will be selected for off-site disposal. The disposal facility information, including locations, will be submitted to the NYSDEC Project Manager for approval and prior to commencing the disposal activities. Waste characterization will be performed for off-site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results, and QA/QC will be reported in the FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

1.8.1 Soil Sampling

Depending upon conditions encountered during construction and monitoring of the Site, additional soil sampling may be required. Any additional soil sampling will be conducted according to the following procedures:

- Characterize the sample according to the modified Burmister soil classification system.
- Collect an aliquot of soil from each sampling location and place in labeled sealable plastic bags. The bag should be labeled with the soil boring number and the depth the sample was collected. Place the plastic bags in a chilled cooler to await selection of samples for laboratory analysis.
- After selecting which samples will be analyzed in the laboratory, fill the required laboratory-supplied sample jars with the soil from the selected sampling location or labeled sealable plastic bags. Seal and label the sample jars as described in Section 1.16 of this QAPP and place in an ice-filled cooler.
- Decontaminate any soil sampling equipment between sample locations as described in Section 1.11 of this QAPP.

- Record boring number, sample depth and sample observations (evidence of contamination, PID readings, soil classification) in field log book and boring log data sheet, if applicable.

1.9 Limited Excavation for Support of Excavation (SOE)

Limited soil excavation work will be conducted during the IRMWP to facility the installation of support of excavation (SOE). The limited excavation will comprise the following activities:

1. Excavated soil will be removed using an excavator in accordance with the Support of Excavation (SOE) Plan. Excavated soils will be managed in separate waste streams as indicated by future waste characterization sampling.
2. All excavated material requiring staging for overnight or longer will follow the procedures in Section 1.9.1.
3. No soil export is currently planned under this IRMWP.

1.9.1 Stockpiling/Staging Area

Prior to excavation, the stockpiling/staging area will be selected and prepared prior to the commencement of excavation activities. Staging area(s) will be prepared for staging any contaminated material overnight or longer using the procedures described below:

The material staging area(s) will be prepared by placing 6-mil plastic on the ground and covered with additional 6-mil plastic sheeting. Sealable containers with tight-fitting covers may also be utilized for the staging of VOC-contaminated material overnight or longer.

1.9.2 Tank Removal

In the event that tanks are encountered at the Site, the tank(s) and any appurtenances will be cleaned, removed and disposed of in accordance with accepted industry standards and applicable Federal, State, and local regulatory agency requirements. Tank and soil removal from the vicinity of discovered underground storage tanks will be conducted in consultation with the NYSDEC.

Typical tank removal procedures are summarized below:

1. Open fill cap or vent pipe and measure for product. Collect a sample of the product. Tank contents will be sampled in accordance with applicable federal, state and local requirements and tested in accordance with the requirements of the receiving facility. Proper disposal of tank contents at an approved facility will be dictated by sample results.
2. Excavate to expose the tank. Vacuum liquid tank contents and pumpable tank bottom residue.
3. Excavate around the tank with care to avoid release of tank and piping contents. Hand excavation around the tank may be necessary. The sides of all excavated areas will be properly stabilized in accordance with OSHA regulations. Continuously monitor the excavated areas in the worker breathing zone for the presence of flammable, toxic or oxygen deficient atmosphere with a photoionization (PID), a combustible gas indicator (CGI), and an oxygen meter.
4. Inert the tank of flammable vapors using dry ice and verify using an oxygen meter (less than 7 percent). An access hole will be cut in the tank and the tank will be thoroughly cleaned of residual liquids and sludges.

5. Entry of the tank, if necessary, shall be conducted in conformance with OSHA confined space requirements.
6. Remaining fuels, loose slurry, sludge materials and wastewater will be collected in DOT-approved drums, sampled and analyzed for disposal characterization. After disposal characterization, waste material will be removed and disposed of in accordance with applicable regulations.
7. Remove the tank and all associated piping from the ground and clean the outside of the tank. The tank and piping will be rendered "not reusable," removed from the site and disposed of according to applicable regulations with proper documentation. Remove and dispose of all concrete tank support structures or vaults as encountered.
8. After tank removal, examine for evidence of petroleum releases in accordance with NYSDEC requirements.
9. Suspect materials will be field-screened with a PID. If soil contamination is present, excavate and remove contaminated soil from the tank areas in accordance with the IRM. Material will be excavated until field screening with a PID yields concentrations of less than 20 parts per million (ppm) and until there are no remaining visible signs of contamination or odors. Endpoint sampling will be conducted as directed by the NYSDEC.
10. Photo-document all procedures and record all procedures in a bound field notebook.

1.10 Excavation Backfill

Any imported soil will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(a). Approval will also be based on an evaluation of the land use, protection of groundwater, and protection of ecological resources criteria. Soil will be considered appropriate for use as on-site imported backfill if contaminant concentrations are below the lesser of the 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and the Protection of Groundwater Soil Cleanup Objectives (PGWSCOs). Soil that meets the 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported to the Site without prior approval by NYSDEC. Solid waste will not be imported to the Site.

Native material from a virgin quarry source need not be sampled prior to use as backfill on the Site. All other imported material will be tested via collection of one composite sample per 1,000 cubic yards of material from each source. Samples will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, target analyte list (TAL) metals by EPA Method 6000/7000 series, PCBs by EPA Method 8082, pesticides by EPA Method 8081, 1,4-dioxane by EPA Method 8270, and the standard list of 40 per- and polyfluoroalkyl substances (PFAS) compounds by EPA Method 1633A.

1.11 Decontamination of Sampling Equipment

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

1. Scrub using a tap water/Alconox® mixture and bristle brush.
2. Rinse with tap water.

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

1.12 Management of Investigation Derived Waste

IDW will be containerized in DOT-approved 55-gallon drums during the investigation activities. The drums will be sealed at the end of each workday and labeled with the date, the boring location(s), the type of waste (i.e., drill cuttings), and the name and phone number of an AKRF point-of-contact. All IDW collected into drums will be sampled and disposed of or treated according to applicable local, state, and federal regulations.

SAMPLING AND LABORATORY PROCEDURES

1.13 Soil Sampling

Soil sampling will be conducted according to the following procedures:

- Characterize the sample according to the modified Burmister soil classification system.
- Describe any evidence of contamination (e.g., non-aqueous phase liquid (NAPL), staining, sheens, odors).
- Field screen the sample for evidence of contamination (e.g., odors, staining) using visual and olfactory methods and screen for VOCs using a photoionization detector (PID) calibrated each day in accordance with the manufacturer's instructions.
- Collect an aliquot of soil from each proposed sample location, place in laboratory-supplied glassware, label the sample in accordance with Section 1.16.1 of this QAPP, and place in an ice-filled cooler for shipment to the laboratory.
- Complete the proper chain of custody paperwork and seal the cooler.
- Record sample location, sample depth, and sample observations (evidence of contamination, PID readings, soil classification, etc.) in a field logbook and boring log data sheet, if applicable.
- Decontaminate any soil sampling equipment between sample locations as described in Section 1.11 of this QAPP.
- Conduct soil sampling for per- and polyfluoroalkyl substances (PFAS) in accordance with the April 2023 *NYSDEC Sampling, Analysis and Assessment Of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs.*

1.14 Laboratory Methods

Table 1 summarizes the laboratory methods that will be used to analyze field samples and the sample container type, preservation, and applicable holding times. Eurofins of Edison, New Jersey, a NYSDOH ELAP-certified laboratory subcontracted to AKRF, will be used for all chemical analyses in accordance with the NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10) Sections 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	VOCs	8260C	EnCore samplers (3) and 2 oz. plastic jar	≤ 6 ºC	48 hours to extract, 14 days to analyze
	SVOCs	8270D	8 oz. Glass Jar	≤ 6 ºC	14 days to extract, 40 days to analyze
	TAL metals, mercury, and hexavalent chromium	6000/7000 Series, 7470A, 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
	PCBs	8082A	8 oz. Glass Jar	≤ 6º C	14 days to extract, 40 days to analyze
	1,4-Dioxane	8270D	4 oz. Glass Jar	≤ 6º C	14 days to extract, 40 days to analyze
	PFAS	1633A	4 oz. HDPE Plastic Jar	≤ 6º C	14 days to extract, 40 days to analyze
	TCLP Metals	6020B and 7196B	8 oz. Glass Jar	≤ 6º C	14 days to analyze

Notes:
EPA - Environmental Protection Agency
RCRA – Resource Conservation and Recovery Act
HDPE – High Density Polyethylene

1.15 Quality Control Sampling

In addition to the laboratory analysis of the soil samples, additional analysis will be included for QC measures, as required by the Category B sampling techniques, including 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). Additionally, one equipment blank will be collected during each day of groundwater sampling. QC samples will be analyzed for the same parameters as the accompanying samples, with the exception of trip blanks, which will be analyzed for the VOC list only. It is noted the QC samples will not be required to be collected during soil waste characterization sampling.

1.16 Sample Handling

1.16.1 Sample Identification

All samples will be consistently identified in all field documentation, chain of custody documents, and laboratory reports. All samples will be amended with a collection date at the end of the sample 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, followed by "MS/MSD"; and trip and field blanks will consist of "TB-" and "FB-", respectively, followed by a sequential number of the trip/field blanks collected within the SDG. Special characters, including primes/apostrophes (’), will not be used for sample nomenclature.

Soil waste characterization samples collected during the IRM will be identified with "WC-" followed by alphanumeric grid number "IRM-MW-" Soil samples will also be amended with the sample collection depth interval. Table 2 provides examples of the sampling identification scheme for samples collected during the investigation.

Table 2
Sample Nomenclature

Sample Description	Sample Designation
Composite soil sample collected from grid A1 between 0 and 5 feet bgs on March 1, 2026	WC-A1_C_0-5_20260301
Grab soil sample collected from grid A4 at 7 feet bgs on March 1, 2026	WC-A4_7_20260301

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

1.18 Quality Assurance

All soil and groundwater laboratory analytical data will be reviewed by a third-party validator and a DUSR will be prepared to document the usability and validity of the data.

1.19 IRM Construction Completion Report (IRMCCR)

The IRMCCR will include a detailed description of sampling activities, data summary tables, figure showing sample locations, DUSRs (excluding waste class samples), and laboratory reports.

ATTACHMENT A
RESUMES FOR REMEDIAL ENGINEER, QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) OFFICER, PROJECT MANAGER, ALTERNATE PROJECT MANAGER, SITE SAFETY OFFICER (SSO), LABORATORY QA/QC OFFICER, AND LABORATORY DATA VALIDATOR

REBECCA KINAL, PE

VICE PRESIDENT/ENVIRONMENTAL ENGINEER

Rebecca Kinal, PE has extensive experience in the assessment and remediation of soil and groundwater contamination and other hazardous/non-hazardous waste problems. Ms. Kinal's experience includes environmental due diligence, soil and groundwater investigations, leaking underground storage tank studies, soil gas/vapor intrusion surveys, and oversight of small- and large-scale remediation programs, including design of groundwater remediation systems and vapor mitigation systems. She has directed numerous Phase I and Phase II assessments and remediation programs, many of them in conjunction with commercial/residential developers, law firms, lending institutions, and public agencies. She is experienced in the cleanup of contaminated properties under New York State Brownfield Cleanup Program (BCP) regulations and the New York City "E-designation" program. As a part of this work, her duties have included technical and report review, engineering design, proposal writing, scheduling, budgeting, and acting as liaison between clients and regulatory agencies, and project coordination with federal, state, and local authorities.

BACKGROUND

Education
MS, Rensselaer Polytechnic Institute, Hydrogeology, 1995
BS, Lafayette College, Civil Engineering, 1992

Licenses/Certifications
Professional Engineer, NY - 082046-1
OSHA 40 Hour HAZWOPER,

Years of Experience
23 years in the industry
19 years with AKRF

RELEVANT EXPERIENCE

New York City School Construction Authority On-Call Contracts for Environmental Consulting Services, Various Sites, NY

Ms. Kinal has served as the project manager for AKRF's on-call hazardous materials consulting contract with the New York City School Construction Authority for over 10 years. For potential new school sites, assignments include initial due diligence; Phase I environmental site assessments (ESAs); and subsurface investigation of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school, likely remediation requirements, and associated costs. For sites undergoing design and development, assignments include preparation of remediation plans, contract specifications, and design drawings. The work has also included conducting indoor air quality testing, vapor intrusion assessments, preparation of specifications and construction management for petroleum storage tank removals, and investigation and remediation of spills for existing schools. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours. Under the contract, Ms. Kinal has managed several major efforts, including emergency remediation work related to flooding from Superstorm Sandy, expedited due diligence for large portfolios of proposed Universal Pre-Kindergarten (UPK and 3K) sites, and large Phase II investigations of sites with NYC Office of Environmental Remediation (OER) E-designations and/or contamination warranting potential NYSDEC involvement.

Montefiore Medical Center, Various Locations, NY

Ms. Kinal provides environmental due diligence assistance to Montefiore Medical Center (MMC) for the ongoing expansion of their facilities, primarily in the Bronx and Westchester County. She conducts and manages environmental

due diligence tasks related to their property transactions, including Phase I Environmental Site Assessments (ESAs), Phase II investigations, indoor air quality surveys/vapor intrusion assessments, and remediation cost estimates. She also assists MMC in making decisions with respect to environmental risk issues. Projects have ranged from small, single-lot properties to large hospital campuses.

Transaction Support, Confidential Client, Various Locations

Ms. Kinal provided transaction support related to the proposed sale of a large construction equipment supply company. She managed inspections of 12 of the company's storage and maintenance yards located in New York, New Jersey, Connecticut, Rhode Island and Massachusetts to assess environmental concerns, and advise the client regarding environmental liabilities related to the proposed sale. The work was completed on an expedited turnaround to comply with the due diligence time-frame.

Brooklyn Technical High School Athletic Field Improvements, Brooklyn, NY

Ms. Kinal provided environmental support services to the selected contractor for improvements to the Brooklyn Tech H.S. athletic field facilities. These services included: preparation of an in situ sampling plan for waste characterization and disposal; supervision of waste characterization sampling activities; development and implementation of a community air monitoring program during all soil disturbance; and coordination for removal of a petroleum storage tank discovered construction.

Street-Works Development, Hamilton Green (200 Hamilton Avenue), White Plains, NY

AKRF prepared the EIS under the New York State Environmental Quality Review Act (SEQRA) and provided site planning and environmental services for the development of Hamilton Green—a new vibrant, mixed-use community in downtown White Plains, NY. Ms. Kinal managed environmental due diligence and remediation planning for the project, which included Phase I and II environmental assessments, a petroleum Spill investigation, preparation of remediation cost estimates, and application and acceptance to the NYSDEC Brownfield Cleanup Program (BCP).

Redevelopment at Polychrome R&D and Manufacturing Sites, AvalonBay, Yonkers, NY

Ms. Kinal served as the Engineer of Record for remediation of the former Polychrome research and development (R&D) site, a NYSDEC Brownfield redevelopment project along the Hudson River. The remediation included hot spot excavation, LNAPL collection, in-situ soil stabilization (ISS), soil management, groundwater treatment, dewatering, shoreline permitting, groundwater discharge permitting, and a site-wide engineered cover systems, including a vapor barrier and sub-slab depressurization system (SSDS). Ms. Kinal reviewed the design documents, supervised field inspections, provided support to the project team regarding contractor submittals and field changes, and certified the Final Engineering Report and Site Management Plan. The Site received its Certificate of Completion in December 2019.

New York City Department of Design & Construction (NYCDDC), East Side Coastal Resiliency (ESCR), New York, NY

AKRF was retained by the NYCDDC to provide a multi-disciplinary design for the protection of Lower Manhattan against another catastrophic hurricane. The main components of the design include levees, berms, retaining walls, cut-off walls, and increasing the ground elevation to mitigate and limit surging flood waters from entering Lower Manhattan. A large portion of the project's subsurface has been impacted by manufactured gas plant (MGP)-related contamination. Ms. Kinal serves as the Engineer of Record for MGP mitigation design components of the project. Her

work includes certification of the Mitigation Work Plan submitted to NYSDEC and review of contract specifications and drawings.

United States Tennis Association, USTA NTC Master Plan Support, Queens, NY

AKRF prepared an EIS for the New York City Departments of City Planning (DCP) and Environmental Protection (DEP) as co-lead agencies to analyze the expansion of the National Tennis Center, which includes multiple improvements and construction projects at the USTA campus over several years. As part of the EIS requirements, AKRF prepared a Remedial Action Plan for implementation during the proposed project's construction. In accordance with the RAP, vapor mitigation systems were incorporated into the design for several of the proposed structures at the facility, including two new stadiums, a new transportation center, and several practice court facilities. Ms. Kinal prepared the specifications and design drawings for the vapor mitigation and provided construction support to review contractor submittals and inspect the vapor barrier and sub-slab depressurization system installations.

New York City Economic Development Corporation (NYCEDC), Yankee Stadium, Bronx, NY

Ms. Kinal performed the hazardous materials analysis for the Draft Environmental Impact Statement for the proposed new Yankee Stadium. The analysis included a Phase I Environmental Site Assessment of the entire project area and Subsurface (Phase II) Investigation in areas where environmental conditions were identified. The Phase II investigation included geophysical surveys to search for potential underground storage tanks; and soil, soil gas, and groundwater sampling at over 40 locations to determine potential environmental impacts during and after the proposed construction. Remedial Action Plans (RAPs) and Construction Health and Safety Plans (CHASPs) were developed to specify environmental monitoring, soil management protocols, and health and safety requirements during construction of the new stadium and redevelopment of the old stadium site. Ms. Kinal also managed an extensive community air monitoring program during demolition of the old Yankee Stadium and construction of the New York City Department of Parks and Recreation's Heritage Field, which included short-term and long-term monitoring for airborne particulates and lead.

Roosevelt Union Free School District, Roosevelt UFSD

Ms. Kinal managed environmental investigation and remediation activities for the sites of three new elementary schools and a new middle school in Roosevelt, New York. Remediation activities include removal/closure of contaminated dry wells and underground petroleum storage tanks, and excavation and off-site disposal of petroleum- and pesticide-contaminated soil. Remediation of the new middle school site, which also included a sub-slab depressurization system, was conducted through coordination with the NYSDEC, NYSDOH, New York State Education Department (NYSED), and the local school district. Upon completion of the remediation and school construction, Ms. Kinal managed confirmatory indoor air testing and preparation of a Final Engineering Report to document the site clean-up. The NYSDEC issued a Certificate of Completion, allowing the new school to open on schedule.

AXEL E. SCHWENDT

VICE PRESIDENT

Mr. Schwendt is a Vice President for AKRF with over 20 years of experience in the environmental consulting field. Mr. Schwendt has extensive experience in Phase II studies involving subsurface soil and groundwater investigations, and has been involved in all aspects of soil and groundwater remediation, including those related to manufactured gas plants (MGP). He has designed, managed and implemented large-scale site investigations and remedial measures for various properties, including those under different regulatory programs such as the New York State Department of Environmental Conservation's (NYSDEC) Voluntary Cleanup Program and Brownfield Cleanup Program, New York State's Spill Response Program, the Mayor's Office of Environmental Remediation (OER) E-Designation Program, New Jersey's Industrial Site Recovery Act (ISRA), and Pennsylvania's Land Recycling program. Mr. Schwendt manages the hazardous materials tasks for the company's Environmental Impact Statements (EISs) and also conducts and manages Phase I Environmental Site Assessments (ESAs) for various individual clients and industries as well as for area-wide rezoning projects.

Mr. Schwendt has extensive experience in underground and aboveground storage tank (UST and AST) management, including tank removals, installations, and upgrades. He has designed and implemented remedial investigations surrounding UST and AST releases and overseen the installation and maintenance of pump-and-treat and other remedial systems. He has performed storage tank compliance audits and maintenance inspections all across the country and prepared Spill Prevention, Control, and Countermeasures Plans (SPCC Plans) for over 100 individual facilities, including designing and conducting the personnel training programs.

Mr. Schwendt worked with several other firms prior to joining AKRF, which provided him with a variety of skills. He has expertise with Chemical Bulk Storage Spill Prevention Reports, Environmental Emergency Response Plans, Integrated Contingency Plans, and multi-phase compliance audits, including some international projects. He has also performed various types of hydrogeologic testing, including pilot tests, slug tests, pump tests and groundwater modeling, and has been responsible for data review and management.

BACKGROUND

Education

B.A., Earth Science and Environmental Studies, Tulane University, 1991

M.S., Geology, University of Delaware, 2002

Years of Experience

Year started in company: 2002

Year started in industry: 1995

RELEVANT EXPERIENCE

New York City Department of Design and Construction (NYCDDC) Feasibility and Pre-Scoping Services for East Side Coastal Resiliency, New York, NY

Mr. Schwendt assisted with the subsurface exploration program for a multidisciplinary design team selected by the New York City agency partnership of NYCDDC, New York City Department of Parks and Recreation (NYCDPR), and Office of Recovery and Resiliency (ORR) for the Feasibility Study and Pre-Scoping Services for East Side Coastal Resiliency (ESCR) project. The AKRF Team provided technical analysis and pre-scoping

services, including complex conceptual design services, for 100+ year storm protection with anticipated sea level rise along the east side of Lower Manhattan. The ESCR subsurface exploration program involved a review of available utility plans and environmental reports involving manufactured gas plant (MGP) and petroleum-related contamination along a 2.5 mile study area from Montgomery Street to East 23rd Street to develop a Subsurface Investigation Work Plan for approval by the New York City Department of Environmental Protection (NYCDEP). The program included both public and private utility mark-out services across vast areas of the project containing critical infrastructure to enable the installation of 81 deep borings, 515 shallow borings, and 10 temporary groundwater wells.

New York City Health and Hospitals Corporation (NYCHHC)'s Post-Sandy mitigation program at Bellevue, Coler-Goldwater, Coney Island, and Metropolitan Hospitals

AKRF is assisting the NYCHHC in the recovery, reconstruction and hazard mitigation of Bellevue Hospital, Coler Hospital, and Coney Island Hospital and other NYCHHC facilities, which were damaged as a result of the Hurricane Sandy disaster. The majority of the funding for these projects will be reimbursed from the Federal Emergency Management Agency (FEMA). AKRF is collecting baseline information and develop study plan and approach, including assessing for critical path approvals, preparing FEMA NEPA Environmental Assessments (EAs), conducting additional studies required by Federal Regulations for FEMA, permitting, and providing design/bid support. Mr. Schwendt is responsible for the hazazrdous materials tasks associated with the program, including conducting Phase I ESAs and subsurface (Phase II) investigations, and preparing necessary work plans and Remedial Action Plans (RAPs)/Construction Health and Safety Plans (CHASPs) for federal, state and city agency review and approval.

NYCDEP Task Order Contracts (TOCs) for Design and Construction Management Services Professional Engineering Design Services and Construction Management (PEDS)

AKRF is currently serving as environmental review and permitting subcontractor under all four NYCDEP TOCs contracts and both PEDS contracts that were recently awarded. In addition to the preparation of environmental review/ULURP documentation and permit applications, AKRF's responsibilities include site selection support, site/civil design, and the preparation of various permit management plans and regulatory compliance tracking in accordance with DEP's Project Delivery Manual. Mr. Schwendt is providing Hazardous Materials consulting services for the TOCs and PEDS contracts, including:

- Prospect Expressway Pump Station Upgrade;
- Clearview Pump Station Reconstruction;
- Rockaway Wastewater Treatment Plant Level 1 Biological Nutrient Removal (BNR) Upgrade; and
- Oakwood Beach Wastewater Treatment Plant Headworks Improvements.

Verdopolis JFK Airport Facility, Queens, NY

On behalf of Verdopolis JFK, AKRF prepared documentation for a New York State Department of Environmental Conservation (NYSDEC) Part 360 Solid Waste Management Facility Permit application. The facility, which would be constructed at the abandoned Hangar 16 site of the John F. Kennedy International Airport (JFK Airport), would process 180,000 tons per year of source separated, pre-consumer organic waste generated largely by food preparation facilities at JFK Airport. Using an anaerobic digestion process, the proposed facility would convert the food waste, which would otherwise be discarded in a landfill or incinerated, into three usable products. Mr. Schwendt assisted in preparing the application package, including preparation of the Engineering Report, Operations and Maintenance Plan, Contingency Plan, Facility Closure Plan, Hiring and Training Plan,

Chemical Bulk Storage Spill Prevention Report, and the Spill Control Prevention and Countermeasure Plan (SPCC Plan). Mr. Schwendt also prepared a Phase I Environmental Site Assessment (ESA) of the property to ascertain potential environmental conditions that may be exposed during site development activities.

2477 Third Avenue, Bronx, NY

Mr. Schwendt prepared the application to enter the former 2477 Third Avenue gasoline station property into the New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP). Since its acceptance into the program, Mr. Schwendt has been managing and coordinating the remedial investigation of the site, including shallow and deep aquifer groundwater testing, delineation of known areas of soil contamination, soil vapor analyses, and investigation for potential non-aqueous phase liquid (DNAPL) from past industrial activities in the surrounding area. Mr. Schwendt was responsible for developing work plans for approval by the NYSDEC and New York State Department of Health (NYSDOH), and for preparing summary reports for public comment. As part of the project, Mr. Schwendt coordinated with the client, lawyers, and architects of the planned development, tenants of neighboring properties, NYSDEC, NYSDOH, and the New York City Department of Environmental Protection (NYCDEP). Mr. Schwendt is also conducting the work necessary to address a hazardous materials E-Designation assigned to the property.

E-Designation Properties/Voluntary Cleanup Program, New York City, NY

Mr. Schwendt has assisted various public and private clients with addressing E-Designations assigned by the New York City Department of Environmental Protection (NYCDEP) to properties throughout New York City. He has prepared the required Phase I Environmental Site Assessments (Phase I ESAs) and implemented Phase II testing to the satisfaction of the New York Office of Environmental Remediation (OER). Based on the results of the testing, he has prepared Remedial Action Plans (RAPs) and Construction Health and Safety Plans (CHASPs) for approval by the NYCOER, which included strategies for mitigating on-site environmental conditions and plans for incorporating environmental engineering controls into proposed construction projects. Mr. Schwendt's clients promptly receive the Notice of Satisfaction necessary to acquire building permits from the New York City Department of Buildings (DOB). Mr. Schwendt has also managed several projects enrolled in the New York City Voluntary Cleanup Program.

St. George Ferry Terminal, Staten Island, NY

Mr. Schwendt prepared a Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) for the Department of Transportation's (DOT) St. George Ferry Terminal facility in Staten Island. The facility's bulk containers store over 600,000-gallons of petroleum used to fuel boilers and emergency generators, provide oil for maintenance and repair of equipment and vessels, and to fuel the ferry vessels. Mr. Schwendt also consulted the DOT on how to upgrade the facility's fueling systems to comply with the SPCC and New York State Department of Environmental Conservation (NYSDEC) regulations.

Mount Sinai Medical Center, Manhattan, NY

Mr. Schwendt managed the Hazardous Materials task for the environmental assessment of the Mount Sinai Medical Center, which is constructing a 700,000 sf, mixed-use residential and bio-medical research facility building. His work included managing the Phase I Environmental Site Assessment (ESA), Phase II investigation, and preparing the Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP) approved by the New York City Department of Environmental Protection (NYCDEP).

Lincoln Center Development Project, New York, NY

On behalf of the Lincoln Center Development Project, Inc., Mr. Schwendt conducted a Subsurface (Phase II) Investigation in the area of an underground storage tank (UST) farm located beneath the lower garage level of the West 62nd Street parking garage at Lincoln Center. The Phase II study was prompted by a request from the New York State Department of Environmental Conservation (NYSDEC) to properly close out the tanks. The tank farm includes seventeen (17) 550-gallon gasoline USTs and one (1) 550-gallon waste oil UST. The purpose of this Phase

II investigation was to determine whether historic leaks from the tanks had affected the subsurface and to assist with future tank closure activities. The Phase II report was submitted to the NYSDEC for review and included a request to close the tanks in-place instead of removing them due to the structural constraints of the tank farm location. Mr. Schwendt also managed the closure of the 18 USTs to the satisfaction of the NYSDEC.

512-522 Vanderbilt Avenue, Brooklyn, NY

On behalf of the Empire State Development Corporation (ESDC), AKRF was retained to provide hazardous material consulting services in connection with the former gasoline station property located at 512-522 Vanderbilt Avenue. Mr. Schwendt performed a Phase I Environmental Site Assessment (ESA), a geophysical survey of the site, and a soil and groundwater subsurface investigation. Data from the investigation would be used to assess remedial strategies during development of the site.

Whitney Museum of American Art, Gansevoort Facility, New York, NY

AKRF has provided various consulting services in support of the Whitney Museum of American Art's long-term planning requirements. Tasks have included transportation surveys, traffic counts, attendance projections, visual impact and shadow studies, economic benefit studies, and two Environmental Assessment Statements (EASs) for proposed new facilities for the Museum. Mr. Schwendt was responsible for the hazardous materials elements of the assessment, including preparing a Phase I ESA and conducting several Subsurface (Phase II) Investigations for review by the New York City department of Environmental Protection (NYCDEP) and Mayor's Office of Environmental Remediation (OER). Mr. Schwendt prepared and managed the implementation of the OER-approved Remedial Action Plan (RAP) for the construction project and is responsible for satisfying all of the associated regulatory reporting requirements. Environmental work at the site also included mitigating a petroleum spill discovered during site excavation activities and coordinating all remedial efforts with the New York State Department of Environmental Conservation's (NYSDEC) Department of Environmental Remediation (DER).

New York Botanical Garden, Bronx, NY

The New York Botanical Garden (NYBG) proposed to construct an accessory parking garage of approximately 825 spaces at Bedford Park Boulevard and Webster Avenue in the Bronx to provide a parking garage for staff and visitors who cannot be accommodated within NYBG's on-site facilities. Mr. Schwendt was the Project Manager for the environmental assessment's hazardous materials work, which included a Phase I Environmental Site Assessment (ESA), Phase II Investigation and the preparation of a Remedial Action Plan (RAP) and a Construction Health and Safety Plan (CHASP) to the satisfaction of the New York City Department of Environmental Protection (NYCDEP). As construction proceeds, Mr. Schwendt will be responsible for managing the environmental monitoring during all subsurface work and preparing the post-construction Closure Report required by the NYCDEP in order to receive the Notice of Satisfaction necessary to obtain occupancy permits from the New York City Department of Buildings (DOB).

Roberto Clemente State Park, Bronx, NY

AKRF participated in the rehabilitation of an existing ballfield, redevelopment of the existing picnic areas, and shoreline restoration along the Harlem River at Roberto Clemente State Park. AKRF is charged with preparing the Joint Permit Application which is necessary to procure the federal, state and local permits and approvals for the shoreline redevelopment. Mr. Schwendt worked with the firm's engineering group to conduct testing to pre-characterize soil to assist with the management of soil during construction. The testing included pre-characterization of soil for on-site reuse in accordance with the New York State Department of Environmental Conservation (NYSDEC) tidal wetland permit requirements and testing for physical parameters required for landscape planning.

Long Island Power Authority (LIPA), Long Island, NY

Mr. Schwendt managed the preparation of Phase I Environmental Site Assessments and Phase II Investigations, along with the Hazardous Materials chapters for Environmental Impact Statements, for properties owned or to be acquired by LIPA to identify potential sources of environmental contaminants prior to power station and power line installation.

Rose Plaza on the River, Brooklyn, NY

Mr. Schwendt conducted a Subsurface (Phase II) Investigation at the 470 Kent Avenue property located in Brooklyn, New York. The objective of the subsurface investigation was to characterize the subsurface soil and groundwater conditions and determine whether past or present on-site and/or off-site potential sources of contamination have adversely affected the site. Results of the Phase II study were also used to evaluate any potential environmental risks and/or the need for remedial action at the site prior to future development. The proposed development of the site includes the construction of approximately 665 market rate dwelling units and approximately 33,750 square feet of commercial uses. The scope of the Phase II study was based on a Phase I Environmental Site Assessment (January 2004) performed by AKRF, which identified recognized environmental conditions for the site, including the potential for soil and groundwater contamination from a historical on-site manufactured gas plant, and potential underground storage tanks. Phase II activities were conducted in accordance with AKRF's Sampling Protocol and site-specific Health and Safety Plan (HASP), which was reviewed and approved by the New York City Department of Environmental Protection (NYCDEP).

Albert Einstein College of Medicine Environmental Investigation, Bronx, NY

Mr. Schwendt managed a Subsurface (Phase II) Investigation at an approximately eight-acre portion of the Jacobi Medical Center fronting on Eastchester Road in the Bronx, New York. The site, owned by New York City, contained an old boiler house, a storage warehouse, a laundry facility, and several paved parking areas. The objective of the subsurface investigation was to characterize the subsurface conditions on the property and determine whether past or present on-site and/or off-site potential sources of contamination have adversely affected the site.

Storage Deluxe, Various Locations, NY

Mr. Schwendt is currently the project manager for assisting Storage Deluxe with the ongoing expansion of their self-storage facilities primarily in the five boroughs of New York City and Westchester County. He conducts and manages environmental due diligence needs related to their property transactions, including Phase I Environmental Site Assessments (ESAs), Phase II investigations, and geophysical surveys, as well as consulting on petroleum bulk storage tank management. He assists Storage Deluxe in making decisions with respect to environmental risk issues.

South Bronx Overall Economic Development Corporation (SoBRO) Port Morris Brownfield Opportunity Areas (BOA), Bronx, NY

Mr. Schwendt is assisting SoBRO with the in-depth and thorough analysis of existing conditions, opportunities, and reuse potential for properties located in the proposed Port Morris Brownfield Opportunity Area with an emphasis on the identification and reuse potential of strategic brownfield sites that may be catalysts for revitalization. His work so far has included the preparation of Phase I Environmental Site Assessments (ESAs) and conducting Phase II investigations for the catalyst sites and advising on the suitability of enacting zoning changes to permit various property uses. Mr. Schwendt also assisted SoBRO with the BOA application process.

Kings Plaza, LLC Total Energy Plant, Brooklyn, NY

Mr. Schwendt has conducted regular environmental compliance reviews of the Kings Plaza Total Energy Plant (TEP) in Brooklyn, New York. The reviews were conducted to observe operations and to review environmental permits, agency correspondence, operating records, recordkeeping and monitoring procedures, and regulatory reporting requirements. As a result of the review, Mr. Schwendt provided the TEP with recommendations for the

management of various waste streams and petroleum/chemical bulk storage associated with facility operations and prepared a Spill Control Prevention and Countermeasure Plan (SPCC Plan) for the facility.

270 Greenwich Street, New York NY

Mr. Schwendt conducted a subsurface (Phase II) investigation that included the advancement of soil borings and the collection of soil and groundwater samples from the 270 Greenwich Street property in the Tribeca neighborhood of New York City. The site will be developed with approximately 402 dwelling units (172 rental units and 230 for sale condominiums), approximately 224,084 gross square feet of destination and local retail space, and below-grade public parking. The purpose of this Phase II subsurface investigation was to ascertain subsurface soil and groundwater quality beneath the site and determine whether past on- or off-site operations have affected the property. The subsurface investigation was also intended to determine whether there are any special handling or disposal requirements for pumped groundwater, should dewatering be necessary during site development. The Phase II study included soil and groundwater sampling as well as a geophysical investigation to determine whether unknown underground storage tanks were present at the site. Field activities were performed in accordance with Mr. Schwendt's Sampling Protocol and Health and Safety Plan (HASP), which were approved by the New York City Department of Environmental Protection (NYCDEP).

Columbia University Manhattanville Rezoning and Academic Mixed-Use Development, New York, NY

Mr. Schwendt managed the hazardous materials task on the Environmental Impact Statement (EIS) for approximately 4 million square feet of new academic, research and neighborhood uses to be constructed north of Columbia University's existing Morningside Heights campus. The work included more than 25 Phase I Environmental Site Assessments (ESAs) for the properties within the rezoning area and estimates for upcoming investigation and remediation. In addition, a Preliminary Environmental Site Assessment (PESA) was completed for the whole project area. Recognized environmental concerns in the area included: current and historical underground storage tanks; current and historical auto-related use such as repair shops and gasoline stations; two historical manufactured gas holders; and a Consolidated Edison cooling plant located on West 132nd Street. Mr. Schwendt conducted a subsurface investigation at the site to characterize the subsurface conditions on the property and determine whether past or present on-site and/or off-site potential sources of contamination have adversely affected the study site, and to use the analytical data to evaluate any potential environmental risks and/or the need for remedial action at the site prior to future development. Based on the results of the investigation, Mr. Schwendt prepared a Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP) for the project, which was approved by the New York City Department of Environmental Protection (NYCDEP).

Hudson River Park, New York, NY

Mr. Schwendt serves as the on-call environmental consultant for the ongoing development of the Hudson River Park, the approximately 5 to 6 mile section of waterfront property from Battery Place to 59th Street along the western edge of Manhattan. He conducts subsurface investigations, coordinates tank removals, implements soil and groundwater remediations, provides guidance on construction and environmental health and safety issues, interfaces with regulatory agencies as necessary, and manages the mitigation of environmental conditions encountered during site development activities.

Brooklyn Bridge Park, Brooklyn, NY

AKRF is providing environmental planning and review services for the development of a new 70-acre park that will revitalize 1.5 miles of the East River waterfront between Jay Street and Atlantic Avenue. When completed, the park will provide open space, recreational facilities, a hotel, restaurants, and retail, historic, and educational venues. Mr. Schwendt was involved with the completion of the Environmental Impact Statement (EIS) and conducted a Phase I Environmental Site Assessment (ESA) and Phase II Subsurface Investigation for the proposed Brooklyn

Bridge Park area. He serves as the park's on-call consultant for addressing environmental conditions as development progresses and has conducted several tank removals and contaminated soil delineation and remediation projects for various sections of the park.

Titan Property Management, Rego Park, NY

Mr. Schwendt was involved with an extensive site investigation for a property involved in the New York State Voluntary Cleanup Program. The property was resting on a plume of PCE contamination. The goal of the investigation was to determine whether the property is the source of the contamination and to collect data to provide information for the design and implementation of a site remedial system. The investigation involved extensive soil, soil gas, and groundwater investigation, and included the investigation of surrounding properties.

ABCO Refrigeration Company, Long Island, NY

Mr. Schwendt managed a tank closure and dry well assessment and remediation project for the ABCO Refrigeration Company. Historic contamination was found seeping from the ground in the location of an old underground storage tank, which is believed to be a source of adverse impact. An adjacent drywell was impacted by the tank as well as from past dumping activities of a former typewriter ribbon ink manufacturing company. A site-wide investigation of the ten drywells was also implemented at the request of the Nassau County Department of Health. Mr. Schwendt undertook soil remedial activities that led to the property receiving closure with respect to the underground storage tank. Drywell remedial activities were successful and the site received approval from the United States Environmental Protection Agency (USEPA) to continue use of on-site drywells.

Levin Management Corporation Property—Site Investigation, Pelham Manor, NY

Mr. Schwendt was involved in the site investigation of a former manufactured gas plant (MGP) that handled petroleum off-loading and storage until the late 1950s. Soils have also been observed to have been affected by non-aqueous phase liquid (NAPL) consisting of oil- and tar-like material. Floating or light NAPL (LNAPL) has also been detected in on-site groundwater. The objectives of the site investigation were to collect additional data to further determine the extent of NAPL-affected soil both above and below the water table throughout the site and to further delineate groundwater contamination throughout the site. The site investigation also sought to confirm the on-site groundwater flow direction and that NAPL had not migrated to the downgradient perimeter of the site, including Eastchester Creek. Mr. Schwendt was brought on board for this project for his expertise in soil and groundwater MGP contaminant delineation.

NYCDEP Bureau of Environmental Engineering 26th Ward Wastewater Treatment Plant—Site Investigation, Brooklyn, New York

Mr. Schwendt managed and conducted environmental sampling and testing at the 26th Ward Wastewater Treatment Plant property located in Brooklyn, New York. This investigation was performed to determine the presence or absence of contamination in the soil and groundwater that would affect the proposed construction of a new raw sewage pump station. Mr. Schwendt provided the 26th Ward with the protocol necessary for the special handling and disposal of the excavated soil as well as for the groundwater that would be pumped during dewatering operations.

Olnick Organization, New York, NY

AKRF was retained by the Olnick Organization to prepare and implement an Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) for their aboveground storage tank system for an office building in Manhattan. Mr. Schwendt performed the site inspections and provided the Olnick Organization with a list of recommendations for upgrades to their fuel transfer piping system that would bring the facility into compliance with SPCC regulations. He also provided Olnick with a plan for implementing the required SPCC training program for their facility personnel.

Site investigations of former MGP Facilities/Properties for Consolidated Edison, New York City, NY & Westchester County, NY

While with another firm, Mr. Schwendt worked on this project, which included a service station in New York City and an electrical substation in Westchester County, New York. Mr. Schwendt performed the site characterizations, including subsurface soil and groundwater impact delineation and aquifer testing. The findings from these characterizations are being used by Consolidated Edison to make appropriate changes to the design specifications and to plan for appropriate handling of impacted materials and health and safety protocols during future construction activities.

UST Site Investigation and Remediation for Consolidated Edison Service Center, Queens, NY

While with another firm, Mr. Schwendt worked on this project, which included due diligence site reviews, soil boring installation, monitoring well installation, hydrogeologic testing, and water quality sampling. Risk-based closures incorporating natural attenuation and groundwater monitoring activities have been proposed. Remedial work plans are under development for other facilities where more aggressive remedial actions are required. Mr. Schwendt also performed subsurface investigations and site characterizations for several other Consolidated Edison facilities including soil-gas surveys and a radiological scoping survey.

Petroleum Bulk Storage Management Program for Bell Atlantic-New York (now Verizon), Manhattan, Brooklyn, Queens, Bronx, Staten Island, and Long Island, NY

While with another firm, Mr. Schwendt personally designed and conducted subsurface investigations for underground storage tank (UST) remediations including characterization of releases, soil and ground water investigations, pilot tests, slug tests, pump tests, groundwater modeling, horizontal and vertical impact delineation, and preparation of compliance documentation for regulatory agencies. He performed oversight of the installation of 'pump and treat' remedial systems and performed maintenance activities. He also supervised UST installations, upgrades and closures; implemented tank tightness testing programs; addressed on-site health and safety issues and other regulatory requirements; prepared closure reports; and managed soil disposal.

Hertz Rent-A-Car Corporate Headquarters, Park Ridge, NJ

While with another firm, Mr. Schwendt served as an in-house consultant/project manager for the environmental department at Hertz's corporate office in Park Ridge, New Jersey. He managed Phase I and Phase II investigations for real estate purchases, leases and acquisitions throughout the United States and Canada. He coordinated Hertz's subcontractors and environmental consulting firms, reviewed reports, and made recommendations to the legal and real estate departments with respect to environmental risk issues.

Temple University, Philadelphia, PA

Mr. Schwendt was a lead auditor for a multi-phase compliance audit of the five campuses of Temple University. The audit included an assessment of all of the Temple University Hospitals, the School of Medicine, the College of Science and Technology, the Tyler School of Art, the College of Engineering, Ambler College (Community and Regional Planning, Horticulture, and Landscape Architecture), the Physical Plant Department, and all university facilities and maintenance departments. Regulatory programs targeted as part of the audit included, but were not limited to, federal and state air and water programs, hazardous waste management, hazardous chemicals and substances, Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) for pesticides, emergency response, Community Right-to-Know, Toxic Substance Control Act (TSCA), and petroleum bulk storage regulations. Following completion of the audit, Mr. Schwendt prepared and implemented an environmental management system that conformed to the needs and culture of the Temple University organization.

University of Pennsylvania, Philadelphia, PA

Mr. Schwendt was the lead auditor for an environmental compliance audit of the University of Pennsylvania's Department of Environmental Health and Radiation Safety. The audit included an assessment for the preparation and implementation of the university's Spill Prevention, Control, and Countermeasures Plans (SPCC Plans). Mr. Schwendt prepared and implemented the university's environmental management program and provided training for the facility personnel.

Wistar Institute, Philadelphia, PA

Mr. Schwendt was the lead auditor for an environmental compliance audit of the Wistar Institute, an independent non-profit biomedical research institute in West Philadelphia, Pennsylvania. The multi-phase audit comprised an assessment of the entire facility for compliance with federal, state and local environmental regulations and included the development of an environmental management system.

Seton Hall University, South Orange, NJ

Mr. Schwendt was a lead auditor for a multi-phase compliance audit of the Seton Hall University campus. The audit comprised an assessment of the entire facility for compliance with federal and state air and water programs, hazardous waste management programs, hazardous chemicals and substances programs, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) for pesticides, emergency response and Community Right-to-Know regulations, the Toxic Substance Control Act (TSCA), and petroleum bulk storage regulations. The audit included the development and implementation of an environmental management system for the Seton Hall University faculty and staff.

New York City College of Technology (City Tech) Academic Building, Brooklyn, New York

Mr. Schwendt is assisting the City University of New York (CUNY) and the Dormitory Authority of the State of New York (DASNY) in addressing the E-Designation assigned to the New York City College of Technology (City Tech) redevelopment project site in Brooklyn, New York. CUNY is proposing to construct an eight-story academic building with classrooms, laboratories, administrative space, and underground parking. Mr. Schwendt conducted the required Phase I Environmental Site Assessment (ESA) and Phase II testing to the satisfaction of the Mayor's Office of Environmental Remediation (OER) and will assist CUNY with entering the project site in the City's Voluntary Cleanup Program (VCP). The work will include preparing the required Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP) and conducting the necessary environmental monitoring during construction. Mr. Schwendt will also prepare the closure documentation required for CUNY to receive the Notice of Satisfaction necessary to obtain occupancy permits from the New York City Department of Buildings (DOB).

New York University Langone Medical Center, New York, NY

Mr. Schwendt managed the hazardous materials task on the EAS for the NYU Langone Medical Center (NYULMC) development project in Manhattan, New York. NYULMC is in the process of developing the Kimmel Program, which consists of two new buildings on its main campus: the Kimmel Pavilion to house hospital functions and an Energy Building to house a combined heat and power (CHP) plant, primary electric service and emergency generators to support the campus, as well as space for patient care (specifically, radiation oncology). The work included conducting Phase I Environmental Site Assessments and Phase II subsurface investigations at each site to characterize the subsurface environmental conditions at the project site. Based on the results of the investigations, a Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP) were prepared for each project phase for submission to the New York City Department of Environmental Protection (NYCDEP) and Mayor's Office of Environmental Remediation (OER). Mr. Schwendt will assist NYULMC by conducting the environmental monitoring required by the agency-approved RAPs/CHASPs as construction progresses, and will prepare the closure documentation required by the agencies to obtain Certificates of Occupancy from the New York City Department of Buildings (DOB).

DASNY Term Environmental Consultant 2006-2012 and 2012-2016, Various Locations, NY

Mr. Schwendt serves as a hazardous materials task leader under the firm's on-call contract with DASNY, through which AKRF is providing State Environmental Quality Review Act (SEQRA) and City Environmental Quality Review (CEQR) environmental review services for a wide range of educational, healthcare and other institutional projects, as well as specialized technical services in historic and archaeological resources, hazardous materials, traffic, air quality, noise, and natural resources. Mr. Schwendt has also assisted DASNY with addressing E-Designations and by conducting various types of environmental investigations, including Phase I and Phase II assessments.

NYCDEP Permit Resource Division On-Call Contract, New York, NY

Under subcontract to a national engineering firm, and as part of two successive Program Management contracts, AKRF is providing support in a wide range of technical areas related to environmental and engineering permits for NYCDEP capital projects. These services fall into two major categories: preparing detailed guidance documents that will be used by project designers and construction managers on future projects, in order to expedite permit approvals and prevent delays; and providing expert review and guidance regarding permits for current projects, in order to ensure completeness of permit applications and effective coordination with regulatory agencies. The technical areas covered by AKRF include: wetlands, groundwater, surface water, and other natural resources; hazardous materials; traffic and transportation; air quality; noise and vibration; historic and archaeological resources; stormwater management; open space and parkland; and a broad range of permits and approvals from the New York City Fire Department (FDNY), the New York City Police Department (NYPD), the New York City Department of Buildings (NYCDOB), and other municipal agencies. AKRF is also helping NYCDEP improve the overall process for tracking environmental and engineering permits and approvals, from the planning and design phases of a project to construction and long-term operation. Mr. Schwendt provides consulting services related to the hazardous materials issues.

Ashutosh Sharma

Senior Technical Director

Ashutosh Sharma is an Environmental Scientist with over 15 years of experience in the environmental consulting field. He has managed and implemented investigations and remedial measures for various properties, including those under different regulatory programs such as the New York State Department of Environmental Conservation's (NYSDEC) Voluntary Cleanup Program and Brownfield Cleanup Program, New York State's Spill Response Program, the Mayor's Office of Environmental Remediation (OER) E-Designation Program. Mr. Sharma has extensive experience in Phase I and Phase II (subsurface) site assessment and remedial investigation, remediation and cleanup of contaminated sites, and construction oversight. He has experience with subsurface soil, groundwater and sub-slab air/vapor sampling procedures, coordinating and running Community Air Monitoring Plans (CAMP) and is familiar with relevant United States Environmental Protection Agency (USEPA), New York State Department of Environmental Conservation (NYSDEC), and New York City Department of Environmental Protection (NYCDEP) environmental laws and regulations.

Background

Education

M.S., Environmental Science, New Jersey Institute of Technology, 2007
B.Tech, Dr. B.R. Ambedkar National Institute of Technology, India, 2005

Years of Experience

Year started in industry: 2007
Year started in company: 2007

Relevant Experience

New York City School Construction Authority: On Call Environmental Consulting
Under an on-call contract, AKRF provides the New York City School Construction Authority (NYCSCA) with hazardous materials consulting services. Mr. Sharma has provided assistance with various environmental assessment tasks including Phase II (Subsurface) Environmental Site Investigations (soil, groundwater and soil gas investigations); Indoor Air Quality (IAQ) and Vapor Intrusion (VI) Assessments; and Underground Storage Tank (UST) investigations. He evaluates the results of the investigations in the context of applicable environmental regulations to assist the project manager and/or project engineer in developing recommendations for remedial actions. Mr. Sharma also provided assistance with the lead in drinking water and plumbing disinfection tasks under the current on-call contract. AKRF also oversees plumbing disinfection work, which is required prior to new plumbing being placed into service. The assignments involve reviewing and commenting on disinfection plans, supervision of the disinfection and confirmation testing, and preparation of reports documenting the work was conducted in accordance with the specifications and applicable requirements. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours.

RXR Realty, NY: Multiple Projects

AKRF has worked with RXR Realty on multiple projects and provided services for completion of Phase I Environmental Site Assessments (ESAs), implemented Phase II Environmental Site Investigations (ESI) and soil waste characterization sampling. Mr. Sharma acted as project manager, overseeing field personnel

implementing the Phase I ESA site reconnaissance the subsurface investigations, as well as completing reports for delivery to the client.

Larkin Plaza, Yonkers, NY

RXR SoYo Exalta LLC enrolled in the New York State Brownfield Cleanup Program (NYS BCP) to investigate and remediate the property located at 25 Warburton Avenue in Yonkers, NY. Mr. Sharma assisted the client in preparing the application to enroll the site in the NYS BCP program.. Mr. Sharma acted as the project manager for the project and prepared the Remedial Investigation Work Plan (RIWP). the Remedial Investigation Report (RIR), the Interim Remedial Measure Work Plan (IRMWP), the Remedial Action Work Plan (RAWP), the Interim Remedial Measures Construction Completion Report and the Site Management Plan (SMP) for the BCP site. Mr. Sharma also managed the field implementation of the remedial investigation and site cleanup activities during the development. Mr. Sharma maintained constant communication with the NYS Department of Environmental Conservation (NYSDEC) project manager and the client during the site redevelopment.

810 Fulton Street, Brooklyn, NY

RXR 810 Fulton Owner LLC developed the property located at 810 Fulton Street in Brooklyn. Mr. Sharma acted as project manager, overseeing field personnel implementing the requirements of the NYC Office of Environmental Remediation (OER)-approved Remedial Action Plan (RAP). Mr. Sharma also coordinated with the OER on behalf of the client on the day to day activities during the remedial action. Mr. Sharma also completed reports for delivery to the client and OER.

Lambert Houses, Bronx, NY

988 East 180th Street Housing Development Fund Corporation enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate the property located at 988 East 180th Street in the Bronx. Mr. Sharma acted as the deputy project manager overseeing field personnel implementing the construction oversight during site redevelopment, and coordinated with the client and their subcontractors. Mr. Sharma prepared the spill investigation work plan, coordinated spill cleanup and prepared the spill closure report to address the petroleum spill encountered during site redevelopment.

Melrose Commons Site C, Bronx, NY

The Bridge Inc. enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate the property located at 988 East 18th Street in the Bronx. Mr. Sharma acted as the deputy project manager overseeing field personnel implementing the construction oversight during site redevelopment, and coordinated with the client and their subcontractors. Mr. Sharma prepared the remedial closure report for delivery to the client.

Essex Crossing Sites 1, 2, 3, 4, 5, 6, and 8, Manhattan, NY

AKRF provided various services during the redevelopment of the Essex Crossing sites in the lower east of Manhattan. Mr. Sharma acted as the deputy project manager overseeing field personnel implementing the construction oversight during site redevelopment, and coordinated with the client and their subcontractors. Mr. Sharma also coordinated spill cleanups and prepared the spill closure reports to address the multiple petroleum spills encountered during redevelopment. Mr. Sharma also coordinated with the client and the New York City Department of Housing & Preservation (HPD) during the implementation of the NYC Department of Environmental Protection (DEP)-approved Remedial Action Plan (RAP). Mr. Sharma also completed reports for delivery to the client.

NYU Langone Medical Center (NYULMC) – Kimmel Pavilion, New York, NY

New York University Langone Medical Center enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate the property located at 424 East 34th Street in Manhattan. The proposed development consisted of a new medical facility. Mr. Sharma acted as the deputy project manager overseeing field personnel implementing the construction oversight during site redevelopment, and coordinated with the client and their subcontractors.

551 Tenth Avenue, New York, NY

Extell 4110 LLC enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate the property located at 547-551 Tenth Avenue in Manhattan. The property was developed with a 52-story residential building with one sub-grade level. Mr. Sharma provided construction oversight during site excavation, spill remediation, coordination and management of soil removal and fill material imports, oversight of the on-site air monitoring program, identification and proper management of contamination encountered during excavation work, and maintenance of critical paperwork and preparation of the final closure report.

Zerega Avenue – Phase I, Phase II and Wetland Survey, Bronx, NY

AKRF was contracted by EDC to conduct perform environmental services at an approximately 255,000-square foot project area located at 530 to 590 Zerega Avenue, Bronx, New York. The work included a Phase I Environmental Site Assessment (ESA), and Phase II Environmental Site Investigation which included preparation of a site-specific health and safety plan, a geophysical survey and utility mark-outs, and the collection and analysis of soil, groundwater, soil vapor, indoor air and ambient air samples. Mr. Sharma provided assistance with subsurface soil, groundwater and soil gas investigation as part of the Phase II investigation of the project site.

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 (BCP). 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 prepared the Final Engineering Report and obtained closure with a Release and Covenant Not to Sue issued by NYSDEC in 2013. AKRF continues operations, maintenance, and monitoring under the NYSDEC-approved Site Management Plan. Mr. Sharma assisted with ongoing operation, maintenance and monitoring of the AS/SVE system.

TF Cornerstone – 606 West 57th Street, New York, NY

AKRF has been retained by TF Cornerstone to provide environmental services for the proposed redevelopment of a portion of the block bounded by Eleventh and Twelfth Avenues and West 56th and 57th Streets. The proposed actions include a zoning map amendment, zoning text amendments, a special permit, and an authorization to facilitate development of approximately 1.2 million square feet of residential and retail space. AKRF is currently preparing an Environmental Impact Statement (EIS) for the New York City Department of City Planning (DCP) to analyze the effects of the proposed actions and development of the proposed building. The EIS will address the full range of environmental impacts associated with the proposed development. As part of the project's review, AKRF also prepared documents and graphics submitted to DCP under its Blue PRint program, a pre-application process that presents basic project information to DCP and clarifies major issues prior to the filing of a land use- or zoning-related application. The process is intended to standardize the pre-application process and expedite DCP's overall project review. Mr. Sharma also provided contractor oversight for the spill remediation activities as requested by the NYSDEC.

Whitney Museum of American Art, NY

Mr. Sharma provided assistance with subsurface soil and groundwater investigation, construction oversight and soil disposal management during the remediation phase of the project. The project included the construction of an approximately 230,000-square foot museum building with one sub-grade level with exhibition galleries, administrative offices, accessory use (café and bookstore), storage space, and an approximately 4,000-square foot restaurant.

Yankee Stadium Demolition, Bronx, NY

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

East River Science Park, New York, NY

The New York City Economic Development Corporation (NYCEDC) proposed to construct two seventeen-story buildings to serve as a biomedical research center. The space between the two towers included an elevated atrium and an outdoor plaza on top of a parking garage. Mr. Sharma provided construction oversight during site excavation, coordination and management of soil removal and fill material imports, oversight of the on-site air monitoring program, identification and proper management of contamination encountered during excavation work, and maintenance of critical paperwork and preparation of the final closure report.

W 61st Street Site, NY

Mr. Sharma provided assistance with construction oversight during site excavation activities and helped prepare the final closure report for the site which, as part of the Brownfield Cleanup Program (BCP), was slated for redevelopment as two residential buildings with a courtyard and a tennis court.

164 Kent Avenue, Brooklyn, NY

The project was a multi-phase development consisting of a large waterfront block in the Williamsburg Rezoning Area. The project site has been developed with a mixed-use residential-commercial high rise towers with an esplanade and a pier along the East River. AKRF provided acquisition and development support, including performing Phase I and II environmental site assessments, and preparation of Remedial Action Plans (RAPs) and Construction Health and Safety Plan (CHASPs) for approval by DEP and OER. AKRF provided assistance with construction oversight during soil handling activities and managing the Community Air Monitoring Plan (CAMP) activities. To date, closure reports have been prepared and occupancy achieved for three of the four buildings. Mr. Sharma provided construction oversight during soil handling activities and running the Community Air Monitoring Plan (CAMP).

285 Jay Street, Brooklyn, NY

Under contract with the Dormitory Authority of the State New York (DASNY), AKRF completed a Phase II Subsurface investigation at the site of a proposed CUNY educational building to satisfy New York City E-designation requirements. As part of the work AKRF performed at the site, Mr. Sharma conducted sub-surface soil and groundwater investigation work and coordinated with the driller and the property owner for successful completion of the work. Mr. Sharma prepared the remedial closure report for delivery to the client.

MTA Long Island Railroad, East Side Access Project, New York, NY

The Metropolitan Transportation Authority (MTA) sponsored the East Side Access project to connect the Long Island Railroad to the Grand Central Terminal, thereby allowing Long Island commuters direct access to the East Side of Manhattan. Mr. Sharma provided assistance with the execution of the Community Air Monitoring Plan (CAMP) at various locations during the construction phase.

Adam Clayton Powell Jr. Boulevard, New York, NY

AKRF performed a Phase II study to meet the requirements of the New York City Department of Environmental Protection (NYCDEP) and to determine whether subsurface conditions had been affected by the on-site and/or off-site petroleum storage tanks and to ascertain whether current or former on- or off-site activities had adversely affected the subject property. Mr. Sharma conducted sub-surface soil and groundwater investigation at the abandoned site slated for future development. He was responsible for coordinating with the driller and the property owner for successful completion of the work.

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.

CHAD WALTERS

Environmental Scientist

Chad Walters is an Environmental Scientist in AKRF's Site Assessment and Remediation Department. His experience includes implementing Phase I Environmental Site Assessments, Subsurface (Phase II) Investigations and/or Remedial Investigations. He is proficient in overseeing remedial action programs under the New York State Department of Environmental Conservation (NYSDEC), Brownfield Cleanup Program (BCP), and NYC Office of Environmental Remediation (OER) E-Designation program, including soil excavation, community air monitoring, remedial system installation, and collection of soil, groundwater, and soil vapor samples.

BACKGROUND

Education

BS, Environmental Studies, Emory University

RELEVANT EXPERIENCE

Starhill at 1600 Macombs Road, Bronx, NY

Chad was responsible for environmental oversight monitoring on the AKRF Team providing site assessment/remediation services for Starhill, a proposed 14-story affordable housing and community facility development in the Bronx. Chad's responsibilities included overseeing soil management and outgoing waste tracking, implementing the Community Air Monitoring Program (CAMP), and preparation of daily reports for Phases I and II. He also performed waste classification sampling for Phase II. AKRF is also preparing the Environmental Assessment Statement pursuant to CEQR requirements.

1559 Boone Avenue, Bronx, NY

Chad was responsible for performing remedial oversight and conducting soil, groundwater, and soil vapor sample collection for a new eight-story, 66-unit supportive housing building at 1559 Boone Avenue in the Bronx. He was also responsible for the oversight of the sub-slab depressurization system and preparation of the Final Engineering Report.

Pilla Colden Avenue, Bronx, NY

Chad served on the AKRF Team involved in the remedial construction for an approximately 9,000-sf site in the Bronx with E-Designations for Hazardous Materials and Air Quality conducted under NYCOER and within NYCOER's Volunteer Cleanup Program. He was responsible for environmental oversight monitoring, which included overseeing soil management and outgoing waste tracking, implementing the CAMP, and preparation of daily and weekly reports for submittal to NYCOER.

NYCHA PACT Williamsburg Houses, Brooklyn, NY

Chad performed remedial oversight for soil excavation and acted as agent for generator in signing off on soil export trucks as part of AKRF's work providing remedial engineering services for the rehabilitation of The Williamsburg Houses under NYCHA's PACT program. The site consists of 20 four-story residential buildings situated on four city blocks. The team is assisting the client with soil management services (testing, import and export), and vapor mitigation work required under a NYCDEP-approved Remedial Action Work Plan (RAWP). The RAWP was prepared by a prior consulting firm, and AKRF successfully amended the RAWP to reduce certain monitoring and vapor mitigation requirements on behalf of the client.

akrf

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Personnel Resume

Carl Armbruster
QA Manager

Qualifications Summary

Mr. Armbruster has over 30 years of experience in the environmental laboratory and engineering industry that includes extensive technical, management/leadership experience in all aspects of the laboratory business. He is an action-oriented manager dedicated to ensuring the laboratory maintains a quality program that holds the highest credentials in PT scores, accreditations and customer satisfaction. His unique experience lends itself to working successfully with employees, managers and clients at all levels.

Professional Experience

Quality Assurance Manager – TestAmerica Edison - 2005 to Present

Mr. Armbruster is responsible for establishing and implementing the quality assurance program at the Edison facility; and for interfacing with the corporate Quality Assurance Director to ensure adherence with the overall Quality Management Plan. He is also responsible for monitoring implementation and compliance with NELAC and TestAmerica's QMP, conducting annual management system audits and data audits, as well as providing regulatory updates and technical support to the Laboratory Director, Operations Manager, Client Services and Sales department.

Project Manager/Assistant Technical Director – STL Edison --2000 to 2005

Laboratory Director − STL Whippany − 1998 to 2000

Account Manager − Clean Harbors Environmental Services − 1997 to 1998

Laboratory Manager − Waste Management Inc., and Chemical Waste Management Inc − 1988 to 1997

Environmental Scientist − ICF Technology − 1987 to 1988

Analytical Chemist − IT Corporation – 1985 to 1987

Analytical Chemist − Hess Environmental Laboratories – 1983 to 1985

Education

- MS in Biology – East Stroudsburg University, 1984
- BS in Environmental Studies - East Stroudsburg University, 1980

L.A.B. Validation Corp., 14 West Point Drive, East Northport, New York 11731

Lori A. Beyer

SUMMARY: General Manager/Laboratory Director with a solid technical background combined with Management experience in environmental testing industry. Outstanding organizational, leadership, communication and technical skills. Customer focused, quality oriented professional with consistently high marks in customer/employee satisfaction.

EXPERIENCE:

1998-Present L.A.B. Validation Corporation, 14 West Point Drive, East Northport, NY
President

- Perform Data Validation activities relating to laboratory generated Organic and Inorganic Environmental Data.

1998-Present American Analytical Laboratories, LLC. 56 Toledo Street, Farmingdale, NY
Laboratory Director/Technical Director

- Plan, direct and control the operation, development and implementation of programs for the entire laboratory in order to meet AAL's financial and operational performance standards.
- Ensures that all operations are in compliance with AAL's QA manual and other appropriate regulatory requirements.
- Actively maintains a safe and healthy working environmental that is demanded by local laws/regulations.
- Monitors and manages group's performance with respect to data quality, on time delivery, safety, analyst development/goal achievement and any other key performance indices.
- Reviews work for accuracy and completeness prior to release of results to customers.

1996-1998 Nytest Environmental, Inc. (NEI) Port Washington, New York
General Manager

- Responsible for controlling the operation of an 18,000 square foot facility to meet NEI's financial and operational performance standards.
- Management of 65 FTEs including Sales and Operations
- Ensure that all operations are in compliance with NEI's QA procedures
- Ensures that productivity indicators, staffing levels and other cost factors are held within established guidelines
- Maintains a quantified model of laboratory's capacity and uses this model as the basis for controlling the flow of work into and through the lab so as to ensure that customer requirements and lab's revenue and contribution targets are achieved.

1994-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York
Technical Project Manager

- Responsible for the coordination and implementation of environmental testing programs requirements between NEI and their customers
- Supervise Customer Service Department
- Assist in the development of major proposals
- Complete management of all Federal and State Contracts and assigned commercial contracts
- Provide technical assistance to the customer, including data validation and interpretation
- Review and implement Project specific QAPP's.

1995-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York
Corporate QA/QC Officer

- Responsible for the implementation of QA practices as required in the NJDEP and EPA Contracts
- Primary contact for NJDEP QA/QC issues including SOP preparation, review and approval
- Responsible for review, verification and adherence to the Contract requirements and NEI QA Plan

1992-1994 Nytest Environmental, Inc. (NEI) Port Washington, New York
Data Review Manager

- Responsible for the accurate compilation, review and delivery of analytical data to the company's customers. Directly and effectively supervised a department of 22 personnel.
- Managed activities of the data processing software including method development, form creation, and production
- Implement new protocol requirements for report and data management formats
- Maintained control of data storage/archival areas as EPA/CLP document control officer

1987-1991 Nytest Environmental, Inc. (NEI) Port Washington, New York
Data Review Specialist

- Responsible for the review of GC, GC/MS, Metals and Wet Chemistry data in accordance with regulatory requirements
- Proficient with USEPA, NYSDEC, NJDEP and NEESA requirements
- Review data generated in accordance with SW846, NYSDEC ASP, EPA/CLP and 40 CFR Methodologies

1986-1987 Nytest Environmental, Inc (NEI) Port Washington, New York
GC/MS VOA Analyst

EDUCATION:

1982-1985 State University of New York at Stony Brook, New York; BS Biology/Biochemistry
1981-1982 University of Delaware; Biology/Chemistry
5/91 Rutgers University; Mass Spectral Data Interpretation Course, GC/MS Training
8/92 Westchester Community College; Organic Data Validation Course
9/93 Westchester Community College; Inorganic Data Validation Course

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

ORGANIC DATA VALIDATION COURSE (35 HOURS)

Dr. John Samuelian

Date AUGUST 1992

Assistant Dean
Professional Development Center

President

The Professional
Development Center

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

INORGANIC DATA VALIDATION

Instructor: Dale Boshart

Date MARCH 1993

Assistant Dean
Professional Development Center

President

The Professional
Development Center

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

July 8, 1992

Ms. Elaine Sall
Program Coordinator
Westchester Community College
Valhalla, NY 10595-1698

Dear Elaine,

Thank you for your letter of June 29, 1992. I have reviewed the course outline for organic data validation, qualifications for teachers and qualifications for students. The course that you propose to offer would be deemed equivalent to that which is offered by EPA. The individuals who successfully complete the course and pass the final written exam would be acceptable to perform the task of organic data validation for the Department of Environmental Conservation, Division of Hazardous Waste Remediation.

As we have discussed in our conversation of July 7, 1992, you will forward to me prior to the August course deadline, the differences between the EPA SOW/90 and the NYSDEC ASP 12/91. You stated these differences will be compiled by Mr. John Samulian.

I strongly encourage you to offer an inorganic data validation course. I anticipate the same list of candidates would be interested in an inorganic validation course as well, since most of the data to be validated consists of both organic and inorganic data.

Thank you for you efforts and please contact me if I can be of any further assistance.

Sincerely,

Maureen P. Serafini

Maureen P. Serafini
Environmental Chemist II
Division of Hazardous Waste
Remediation

The Professional
Development Center
AT
WESTCHESTER COMMUNITY COLLEGE

914 285-6619

October 2, 1992

Ms. Lori Beyer
3 sparkill Drive
East Northport, NY 11731

Dear Ms. Beyer:

Congratulations upon successful completion of the Organic Data Validation course held August 17 - 21, 1992, through Westchester Community College, Professional Development Center. This course has been deemed by New York State Department of Environmental Conservation as equivalent to EPA's Organic Data Validation Course.

Enclosed is your Certificate. Holders of this Certificate are deemed competent to perform organic data validation for the New York State DEC Division of Hazardous Waste Remediation.

The Professional Development Center at Westchester Community College plans to continue to offer courses and seminars which will be valuable to environmental engineers, chemists and related personnel. Current plans include a TCLP seminar on November 17th and a conference on Environmental Monitoring Regulations on November 18th.

We look forward to seeing you again soon at another environmental program or event. Again, congratulations.

Very truly yours,

Passing Grade is 70%
Your Grade is 99%

Elaine Sall
Program Coordinator

ES/bf

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

The Professional
Development Center
AT
WESTCHESTER COMMUNITY COLLEGE

914 285-6619

June 21, 1993

Dear Ms. Beyer:

Enclosed is your graded final examination in the Inorganic Data Validation course you completed this past March. A score of 70% was required in order to receive a certificate of satisfactory completion. Persons holding this certificate are deemed acceptable to perform Inorganic Data Validation for the New York State Department of Environmental Conservation, Division of Hazardous Waste Remediation.

I am also enclosing a course evaluation for you to complete if you have not already done so. The information you provide will greatly aid us in structuring further courses. We wish to make these course offerings as relevant, targeted and comprehensive as possible. Your evaluation is vital to that end.

Congratulations on your achievement. I look forward to seeing you again at another professional conference or course. We will be co-sponsoring an environmental monitoring conference on October 21, 1993 with the New York Water Pollution Control Association, Lower Hudson Chapter, at IBM's Yorktown Heights, NY site. Information regarding this event will be going out in August.

Very truly yours,

Elaine Sall

Elaine Sall
Program Coordinator

ES/bf

Enclosures

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595