The Crossing at Jamaica Station

QUEENS, NEW YORK

Remedial Investigation Work Plan

AKRF Project Number: 12146

NYSDEC Site Number: TBD

Prepared for:

BRP Development Corp.
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Prepared by:

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FEBRUARY 2016

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1.0 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) has been prepared by AKRF, Inc. (AKRF), on behalf of BRP Development Corp. for The Crossing at Jamaica Station site located at 147-22 Archer Avenue, in the Jamaica section of Queens, New York (hereafter referred to as the "Site"). The approximately 1.57-acre site is also identified as Block 9998, Lot 83. A Site location map is provided as Figure 1. A Site Plan showing the Site and surrounding properties is provided in Figure 2.

Historical reports indicated that the southwestern and central portions of the Site included a filling station, a garage, a kitchen cabinet manufacturer, and a garage door company with two buried gasoline storage tanks between 1942 and 1951, unspecified commercial uses, and automotive repair shops between 1981 and 2007. The eastern portion of the Site historically had residential, commercial, and religious uses.

The proposed project involves demolition of the current structures and construction of two mixed-use buildings. One cellar level will be constructed, which will require excavation to approximately 16 feet below grade. The buildings will occupy the entire Site and will include basement and first floor commercial space with affordable housing above. Based on previous subsurface investigations, the water table is approximately 24 to 25 feet below grade. Redevelopment activities are not anticipated to require dewatering.

This RIWP describes the procedures to be used to further characterize general soil, groundwater, and soil vapor conditions under the proposed buildings' footprints. These RI activities are proposed to be conducted following the acceptance of the Site into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). A BCP Application is being submitted concurrently with this RIWP. This RIWP provides a review of the Site history, previous investigations, specific investigative tasks, and a schedule to complete proposed soil and soil vapor sampling. All work will be performed in accordance with this RIWP, which includes a Quality Assurance Project Plan (Appendix A) and the Health and Safety Plan (Appendix B).

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description and Surrounding Land Use

The Site is located at 147-22 Archer Avenue in the Jamaica section of Queens, New York (Block 9998, Lot 83), and is approximately 1.57 acres. Currently, the Site comprises a mix of vacant commercial and residential buildings, two vacant/former garages, and vacant lots. The Site is bounded by Archer Avenue to the north, followed by commercial and industrial uses; a commercial building to the east; the Long Island Rail Road (LIRR) to the south, and Sutphin Boulevard to the west, followed by the LIRR. Properties in the surrounding areas are predominately industrial and commercial; with some residences further north and south.

2.2 Topography, Geology, and Hydrogeology

Topography at the Site is relatively level. Based on the U.S. Geological Survey, Jamaica, NY Quadrangle (2010) map, the Site is approximately 50 feet above the National Geodetic Vertical Datum of 1988 (an approximation of mean sea level). Based on previous subsurface investigations, groundwater beneath the Site flows generally in a southerly direction towards Jamaica Bay, approximately 4 miles south of the Site. Localized groundwater flow in the vicinity of the Site is likely influenced by topography, but may also be affected by other factors including: past filling activities, underground utilities and other subsurface openings or obstructions, and other factors.

Based on results of the RI, subsurface materials at the Site consist of approximately three to 10 feet of historical fill material (including sand, silt, crushed rock, concrete, asphalt, and brick) underlain by apparent native sand, silt, gravel, and clay to approximately 16 feet below grade (the terminal boring depth). Groundwater was encountered at depths ranging from approximately 24 to 25 feet below grade at the Site.

2.3 Site History

Historical reports (discussed in Section 3.0) indicated that the western and central portions of the Site included a filling station, a garage, a kitchen cabinet manufacturer, and a garage door company with two buried gasoline storage tanks between 1942 and 1951, unspecified commercial uses, and automotive repair shops between 1981 and 2007. The eastern portion of the Site included residential, commercial, and religious uses.

3.0 PREVIOUS INVESTIGATIONS

3.1 Phase I Environmental Site Assessment

A Phase I Environmental Site Assessment (ESA) conducted by Hillmann Consulting in February 2014, included a Site inspection, historical research, and a regulatory review for the Site. It identified the following Recognized Environmental Conditions (RECs):

- The Site is listed on the NYC E-Designation Database for Underground Storage Tanks testing Protocol (as well as Air Quality, Window Wall Attenuation & Alternate Ventilation, and Exhaust Stack Location Limitations);
- An active 3,510-gallon No.2 fuel oil vaulted aboveground storage tank (AST) registered under PBS Number 2-153605 was observed in the basement of a 93-01 Sutphin Boulevard (western portion of the Site);
- A filling station with five gasoline underground storage tanks (USTs) was shown at 93-01 Sutphin Boulevard (southwestern portion of the Site) on the 1942 to 1951 fire insurance maps;
- An inactive 275-gallon AST was observed in the basement of 147-22 Archer Avenue (central portion of the Site) and fire insurance maps from 1981 to 2006 identified an auto repair shop at this location;
- Fire insurance maps from 1942 to 1951 depicted two gasoline USTs beneath the 147-30 Archer Avenue building (northeastern portion of the Site); and
- A fuel oil fill port was noted outside 147-12 Archer Avenue. Fuel oil vent pipes were observed abutting 147-14 and 147-30 Archer Avenue.

3.2 Draft Remedial Investigation Report

AKRF conducted a Remedial Investigation at the Site in May 2015 that included the advancement of 11 soil borings, 2 temporary groundwater monitoring wells, and 9 soil vapor probes, with the collection and laboratory analysis of 22 soil samples, 4 groundwater samples (two from geotechnical wells installed by others), and 9 soil vapor samples. Results were as follows:

- The soil sampling results were compared to NYSDEC 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and Restricted-Residential Use SCOs (RRSCOs). Several volatile organic compounds (VOCs) and polychlorinated biphenyls (PCBs) were detected at trace concentrations, all below UUSCOs. Several polycyclic aromatic hydrocarbons (PAHs) including benzo(a)anthracene [(maximum of 1,400 micrograms per kilogram (µg/Kg)], benzo(a)pyrene (maximum of 1,400 µg/Kg), benzo(b)fluoranthene (maximum of 1,900 µg/Kg), chrysene (maximum of 1,400 µg/Kg), and indeno(1,2,3-cd)pyrene (maximum of 680 µg/Kg) were detected above RRSCOs in three samples. Metals, including barium (maximum of 620 mg/Kg), lead (maximum of 760 mg/Kg), and mercury (maximum of 0.98 mg/Kg) exceeded their RRSCOs in one or more samples. The elevated metals concentrations were detected primarily in the shallow 0-2 foot interval and could be attributable to fill materials. Two pesticides (4,4'-DDE, 4,4'-DDT) slightly exceeded their UUSCOs in up to three samples, but were below their RRSCOs.
- Groundwater sample results were compared to NYSDEC Class GA Ambient Water Quality Standard (AWQS) and indicated that one VOC, chloroform, was detected in two of the four groundwater samples at maximum concentrations of 50 micrograms per liter (µg/L), above its AWQS of 7 µg/L. Several other VOCs and semivolatile organic compounds (SVOCs) were detected at trace concentrations below AWQS. Nineteen metals were detected; and iron, manganese, antimony and sodium were detected above AWQS standards in one or more samples (total and dissolved analysis). No PCBs were detected above the AWQS. One pesticide, chlordane, was detected in one sample at an estimated concentration of 0.187 µg/L, above the AWQS of 0.05 µg/L.
- Soil vapor results were compared to the indoor air guidelines in the New York State Department of Health (NYSDOH) *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York,* dated October 2006. Sampling identified 32 VOCs in the 9 samples at concentrations ranging from 0.95 to 830 micrograms per cubic meter (µg/m^3). Tetrachloroethene (PCE) exceeded the indoor air decision matrix value of 100 µg/m^3 in one sample with a concentration of 219 µg/m^3. Trichloroethene (TCE) exceeded the indoor air decision matrix value of 5 µg/m^3 in three samples (maximum concentration 10.3 µg/m^3).

AKRF conducted a supplemental subsurface investigation on December 7 and 8, 2015. It included advancement of 7 soil borings with the collection of 14 soil samples for laboratory analysis. Results were as follows:

- The 14 soil sampling results were compared to UUSCOs and RRSCOs. The VOCs acetone and naphthalene were detected in two samples at concentrations above UUSCOs (but below the RRSCOs), at concentrations ranging from 78 µg/Kg (acetone) to 19,000 µg/Kg (naphthalene). Several PAHs including benzo(a)anthracene (maximum of 41,000 µg/Kg), benzo(a)pyrene (maximum of 30,000 µg/Kg), benzo(b)fluoranthene (maximum of 38,000 µg/Kg), benzo(k)fluoranthene (maximum of 9,400 µg/Kg), chrysene (maximum of 34,000 µg/Kg), dibenzo(a,h)anthracene (maximum of 6,100 µg/Kg), and indeno(1,2,3-cd)pyrene (maximum of 23,000 µg/Kg) were detected above RRSCOs (and UUSCOs) in four samples.
- Metals, including barium (maximum of 1,800 mg/Kg), cadmium (maximum of 7.4 mg/Kg), lead (maximum of 870 mg/Kg), and mercury (maximum of 2.9 mg/Kg) exceeded RRSCOs (and UUSCOs) in one or more samples. Arsenic, copper, and zinc exceeded UUSCOs but not RRSCOs. Elevated metals concentrations were detected in shallow samples collected primarily within the upper 4 feet, and are likely attributable to fill materials.

- Two pesticides (4,4'-DDE, 4,4'-DDT) slightly exceeded UUSCOs in up to three samples, but were below RRSCOs.

4.0 FIELD PROGRAM

The RI will include soil, groundwater, and soil vapor sampling to additionally characterize conditions under the proposed buildings' footprints. All borings, monitoring wells, and soil vapor sampling points will be installed using a Geoprobe® Direct Push Probe (DPP) unit or similar. The proposed scope is as follows (tentative locations are indicated on Figure 2):

- Advancement of and sampling from 14 soil borings to further characterize soil anticipated to be excavated during Site redevelopment;
- Installation of and sampling from 5 two-inch diameter permanent (pre-pack)groundwater monitoring wells; and
- Installation of and sampling from 7 soil vapor points to evaluate the potential for vapor intrusion.

All field work will be conducted in accordance with the Quality Assurance Project Plan (QAPP), provided as Appendix A, and the Health and Safety Plan (HASP), provided as Appendix B. Community air monitoring will be conducted as described in Section 2.62 of the HASP.

4.1 Soil Sampling

Fourteen soil borings will be advanced at the locations shown on Figure 2. Soil cores will be collected continuously from each boring to the proposed maximum excavation depth of 16 feet. At each boring, AKRF field personnel will record and document subsurface conditions, including screening of soil cores using a photoionization detector (PID). Observations will be made as to the presence of potential contamination in the soil cores. At a minimum, two soil samples will be collected from each boring (for a total of 28 soil samples) for laboratory analysis. In general, a surface shallow soil sample (from the 0-2 feet below any paving) and a deeper soil sample from the 2-foot interval beneath the proposed excavation depth. A third soil sample may be collected from a boring if elevated PID readings and/or visual and olfactory observations indicate contamination may be present.

Soil 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, and pesticides by EPA Method 8081. Samples will be analyzed by a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory providing Category B deliverables. One aqueous field blank, one field duplicate, and one matrix/matrix spike duplicate (MS/MSD) will be collected for quality control/quality assurance (QA/QC) purposes at a rate of one QA/QC sample per 20 field samples, and analyzed for the same parameters.. In addition, one laboratory-supplied aqueous trip blank will accompany the sample shipment, but will be analyzed for VOCs only.

Upon completion of sampling, each boring will be filled to near grade with either the drill cuttings or a cement/bentonite grout mixture (if gross contamination is identified). Soil borings filled with cuttings will be completed to grade using drilling sand, if necessary. Borings will be patched with asphalt or concrete.

4.2 Monitoring Well Installation and Groundwater Sampling

Five of the borings will be converted into two-inch diameter groundwater monitoring wells, tentatively at the locations indicated on Figure 2. The wells will be installed to approximately 35 feet below grade and constructed with a 15-foot 20-slot well screen across the water table, sand pack, and j-plug. The wells will be finished with a bentonite seal and grouted to ground surface, with a flush-mount locking well cover. The wells will be developed immediately upon installation until the groundwater is clear. Representative groundwater samples will be collected using low-flow sampling techniques (e.g., peristaltic pump) one to two weeks after installation. Monitoring wells will be gauged with a water level meter to record depth to groundwater (1/100 foot), and an interface meter to determine the presence/thickness of any LNAPL or DNAPL.

Groundwater samples will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, TAL metals by EPA Methods 6010 and 7471 (both total and dissolved analysis), pesticides by EPA Method 8081, and PCBs by EPA Method 8082. All samples will be analyzed by a NYSDOH ELAP-certified laboratory providing Category B deliverables. One field blank, one blind duplicate, and one MS/MSD sample will be collected for QA/QC purposes and analyzed for the same parameters. In addition, one laboratory-supplied aqueous trip blank will accompany the sample shipment, but will be analyzed for VOCs only.

The monitoring wells will be surveyed by a New York State-licensed surveyor. Two elevation measurements will be taken for each well (grade and top of PVC casing) to facilitate preparation of a groundwater contour map and determine the approximate direction of groundwater flow.

4.3 Soil Vapor Sampling

Seven soil vapor points will be installed at approximately the locations indicated on Figure 2, and in accordance with the *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. Soil vapor samples will be collected using a dedicated stainless steel probe, consisting of a drive point and internal perforated sampling port with a retractable tip, connected to disposable Teflon sampling tubing. The sampling tubing will extend from the sampling port through a drive casing to above grade. The soil vapor samples (and concurrent ambient air sample) will be collected using batch-certified 6-liter Summa canisters equipped with 2-hour flow controllers.

As part of the vapor intrusion evaluation, a tracer gas, helium, will be used in accordance with New York State Department of Health (NYSDOH) protocols to serve as a QA/QC device to verify the integrity of the soil vapor probe seal. A container (box, plastic pail, etc.) will serve to keep the tracer gas in contact with the probe during testing. A portable helium monitoring device will be used to analyze a sample of soil vapor for helium prior to sampling. If the tracer sample results show a significant presence of helium, the probe seals will be adjusted to prevent infiltration.

One ambient (outdoor) air sample will be collected concurrently with the soil vapor samples. All samples will be analyzed for VOCs by EPA Method TO-15 by a NYSDOH-ELAP laboratory certified to perform NYSDEC ASP. The laboratory will produce Category B deliverables.

4.4 Decontamination Procedures

All non-dedicated sampling equipment (push-probe rods, macro-core sampler, sampling spoons, etc.) will be decontaminated between locations. The decontamination procedure will be as follows:

1. Scrub using tap water/Simple Green® mixture and bristle brush.
2. Rinse with tap water.
3. Scrub again with tap water/Simple Green® and bristle brush.
4. Rinse with tap water.
5. Rinse with distilled water.

6. Air dry the equipment.

Decontamination will be conducted within five-gallon buckets to capture decontamination water. All decontamination water will be handled as described in Section 4.6.

4.5 Laboratory Turnaround & Investigation-Derived Waste

Laboratory analyses for soil, groundwater, and soil vapor samples will be requested on a standard 5 to 10 business day turnaround (following sample receipt by the laboratory) using Category B deliverables.

Investigation derived wastes (IDW) will be minimized by returning excess soil from soil borings to its original location unless grossly contaminated, per DER-10(3.3)(e). Decontamination fluids will be discharged to the ground unless gross contamination is identified. If field evidence of gross contamination is apparent, the material will be drummed and staged near the point of generation, and will be properly disposed of based on laboratory results. If free of visible contamination, disposable personal protective equipment (PPE) and sampling equipment (scoops, gloves, rope, etc.) will be placed in heavy-duty plastic bags and disposed of as general refuse.

4.6 Data Review

In accordance with DER-10, data from the samples collected as part of the RI will undergo third party review for usability. Data usability summary reports documenting any QA/QC issues will be included in the RI Report.

5.0 REPORTING REQUIREMENTS

5.1 Remedial Investigation Report

Upon completion of the field activities and receipt of the laboratory results, a Remedial Investigation Report (RIR) will be prepared that summarizes the findings and compares the analytical results to NYSDEC and NYSDOH standards and guidelines. The data will be summarized in tables and figures. The report will include conclusions and, if necessary, recommendations for additional sampling, remediation or other appropriate measures. The findings in the RIR will be used to develop a Remedial Action Work Plan (RAWP).

6.0 SCHEDULE OF WORK

The following tentative schedule has been developed:

Remedial Investigation Schedule

Task	**Date**
Submission of Remedial Investigation Work Plan	February 2016
NYSDEC Approval of Remedial Investigation Work Plan	February/March 2016
Execution of Brownfield Cleanup Agreement	April 2016
Completion of Remedial Investigation Field Activities	June/July 2016
Submission of Remedial Investigation Report	August/September 2016

7.0 CERTIFICATION

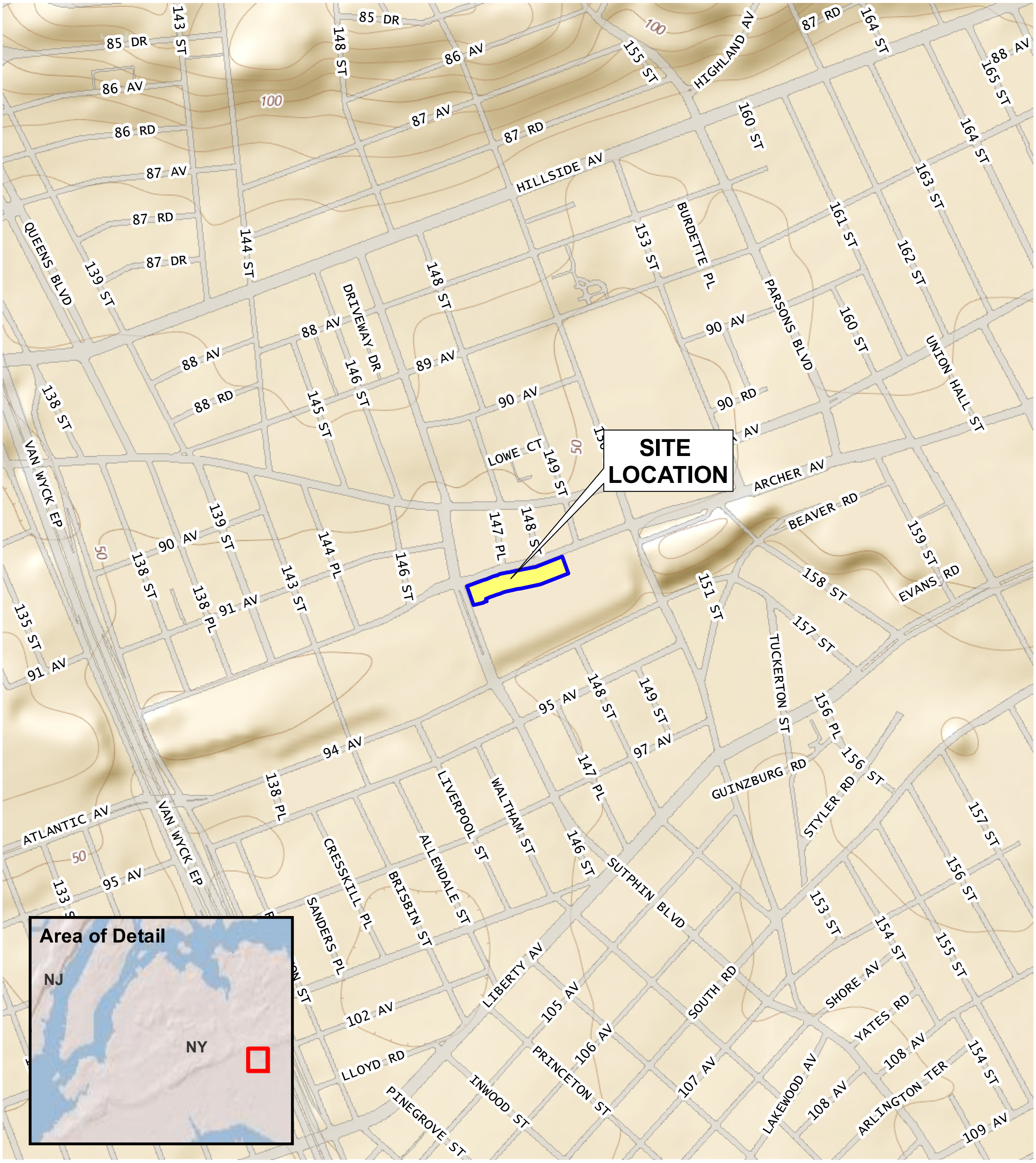
I, Marcus Simons , certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for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

Marcus Simons		2/16/2016
Name	***Signature***	***Date***

8.0 REFERENCES

1. U.S. Geological Survey; Jamaica, New York – Quadrangle; 7.5 Minute Series (Topographic); Scale 1:24,000.
2. New York State Department of Environmental Conservation, Division of Environmental Remediation, Draft DER-10/Technical Guidance for Site Investigation and Remediation, December 2002.
3. New York State Department of Health, Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006.
4. New York State Department of Environmental Conservation, Division of Environmental Remediation, DER-13/Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York, October 2006.
5. Phase I Environmental Site Assessment, The Crossing – Block 9998, Lots 83, 86, 87, 88, 89, 90, 91, 93, 94, 95, & 101, Jamaica, NY
6. Draft Remedial Investigation Report, The Crossing at Jamaica Station – Block 9998, Lots 83, 86-91, 93-95, & 101, Queens, NY

FIGURES



SOURCE
USGS 7.5 Minute Topographic Map
Jamaica Quad 2013

0 800 1,600
Feet

The Crossing at Jamaica Station
Queens, New York

SITE LOCATION

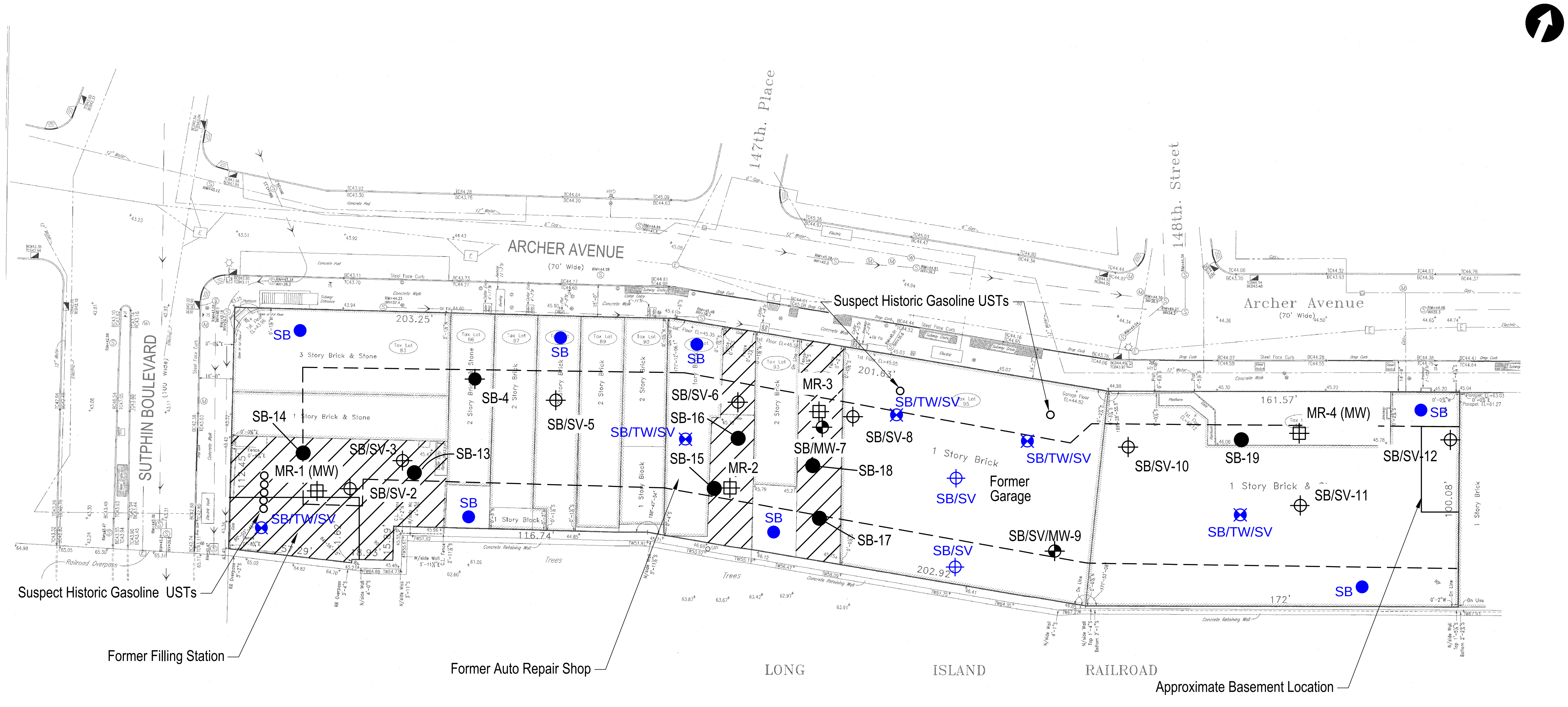
AKRF
Environmental Consultants
440 Park Avenue South, New York, N.Y. 10016

DATE
2/18/2016

PROJECT No.
12146

FIGURE
1

W:\Projects\12146 - THE CROSSING JAMAICA STATION QUEENS\Technical\GIS and Graphics\hazmat\12146 Fig 1 site loc map.mxd



LEGEND:

- - - - LIMIT OF MTA/LIRR BORING OFFSET

▨ VACANT LOT

SB/MW-7 SOIL SAMPLE AND GROUNDWATER SAMPLE LOCATION

SB-4 SOIL SAMPLE LOCATION

SB/SV-2 SOIL AND SOIL VAPOR SAMPLE

MR-2 GEOTECHNICAL BORING LOCATION

MR-4 (MW) GEOTECHNICAL MONITORING WELL LOCATION AND GROUNDWATER SAMPLE

UST SUSPECT UNDERGROUND STORAGE TANK

SB/SV/MW-7 SOIL SAMPLE/VAPOR/ GROUNDWATER SAMPLE LOCATION

● SB-13 SUPPLEMENTAL BORING LOCATION - 12/7-12/8/2015

● SB PROPOSED SOIL SAMPLE

SB/SV PROPOSED SOIL AND SOIL VAPOR SAMPLE

SB/TW/SV PROPOSED SOIL, TEST WELL, AND SOIL VAPOR SAMPLE

Map Source:
ERLANDSEN-CROWELL & SHAW, "ALTA/ACSM Land Title Survey", Dated: April 2,2014

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The Crossing at Jamaica Station
Queens, New York

SITE PLAN AND SAMPLING LOCATIONS

DATE
1/22/2016

PROJECT NO.
12146

SCALE
as shown

FIGURE
2

W:\Projects\12146 - THE CROSSING JAMAICA STATION QUEENS\Technical\HazMat\BCP Application\CAD\12146 Fig 2 Sample Locations.dwg

APPENDIX A
QUALITY ASSURANCE PROJECT PLAN

The Crossing at Jamaica Station

QUEENS, NEW YORK

Quality Assurance Project Plan

AKRF Project Number: 12146

NYSDEC Site Number: TBD

Prepared for:

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ATTACHMENTS

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures to be followed during implementation of the Remedial Investigation Work Plan (RIWP) at the Crossing at Jamaica Station site (the "Site") located in the Jamaica section of Queens, New York. The objective of the QAPP is to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental investigative, sampling and remedial activities conducted under the RIWP. Adherence to the QAPP is necessary to ensure that defensible data is obtained during investigation and remediation.

2.0 PROJECT TEAM

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

2.1 Project Director

The project director will be responsible for the general oversight of all aspects of the project, including scheduling, budgeting, data management, and decision-making regarding the field program. The project director will communicate regularly with all members of the AKRF project team and the New York State Department of Environmental Conservation (NYSDEC) to ensure a smooth flow of information between involved parties. Axel Schwendt will serve as the project director for the RI. Mr. Schwendt's resume is included in Attachment A.

2.2 Project Manager

The project manager will be responsible for directing and coordinating all elements of the RI. Neoma Chefalo will serve as the project manager for the RI. She will prepare reports and participate in meetings with the Site owner and/or the NYSDEC. Ms. Chefalo's resume is included in Attachment A.

2.3 Field Team Leader

The field team leader will be responsible for supervising the daily sampling and health and safety activities in the field, will ensure adherence to the work plan and HASP and will be a qualified, responsible person, able to act professionally and promptly during soil disturbing activities. Adrianna Bosco will be the field team leader for the RI. She will report to the Project Manager on a regular basis regarding daily progress and any deviations from the work plan. The field team leader.

2.4 Project Quality Assurance/Quality Control Officer

The Quality Assurance/Quality Control (QA/QC) Officer will be responsible for adherence to the QAPP. Marcus Simons will serve as the QA/QC officer for the RI. He will review the procedures with all personnel prior to commencing any fieldwork and will assess implementation of the required procedures. Mr. Simons' resume is included in Attachment A.

2.5 Laboratory Quality Assurance/Quality Control Officer

The laboratory QA/QC officer will be responsible for quality control procedures and checks in the laboratory and ensuring adherence to laboratory protocols. He/she will track the movement of samples from the time they are checked in at the laboratory to the time that analytical results are issued. He/she will conduct a final check on the analytical calculations and sign off on the laboratory reports. The laboratory QA/QC officer will be determined upon selection of a contract laboratory(s) for the RI.

3.0 STANDARD OPERATING PROCEDURES

The following sections describe the standard operating procedures (SOPs) for the investigative activities included in the RIWP. During these operations, safety monitoring will be performed as described in the project Health and Safety Plan (HASP) and all field personnel will wear appropriate personal protective equipment. The RI will include soil sampling, groundwater sampling, and soil vapor sampling.

3.1 Soil Sampling

3.1.1 Soil Borings

The RIWP includes advancement of 14 soil borings. The borings will be completed to characterize shallow and deeper subsurface soils within the proposed buildings' footprints and to collect soil samples for laboratory analysis. Figure 2 in the RIWP depicts the proposed soil boring locations. The borings will be advanced to approximately 16 feet below ground surface (bgs).

The soil borings will be installed using a Geoprobe® Direct Push Probe (DPP) unit or similar. Continuous soil cores will be collected by driving a macrocore sampling tube into the subsurface at five-foot intervals until the target depth. An acetate liner fitted within the macrocore sampler will be removed after each sampling interval and cut lengthwise to access the soil core for logging, screening, and laboratory sampling.

Logging will consist of: describing the soil according to the modified Burmister Classification System; describing any evidence of contamination (e.g., non-aqueous phase liquid (NAPL), staining, sheens, odors); and screening for organic vapors using a photoionization detector (PID) calibrated at the start of each day in accordance with the manufacturers instructions.

Two soil samples will be collected from each boring (a total of 28 soil samples) for laboratory analysis. A surface shallow soil sample (from the 0-2 feet below grade/paving interval) and a deeper soil sample from the 2 foot interval beneath the proposed excavation depth. A third sample may be collected if elevated PID readings and/or visual or olfactory observations are noted.

Soil samples will be analyzed for volatile organic compounds (VOCs) by EPA Method 8260, semivolatile organic compounds (SVOCs) by EPA Method 8270, Target Analyte List (TAL) metals by EPA Method 6000/7000 series, polychlorinated biphenyls (PCBs) by EPA Method 8082, and pesticides by EPA Method 8081. All samples will be analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory providing Category B deliverables. One aqueous field blank, one field duplicate, and one matrix/matrix spike duplicate (MS/MSD) will be collected for quality control/quality assurance (QA/QC) purposes at a rate of one QA/QC sample per 20 field samples, and analyzed for the same parameters. In addition, one laboratory-supplied aqueous trip blank will accompany the sample shipment, analyzed for VOCs only.

3.1.2 Restoration

Upon completion of probing/drilling, each boring will be filled to near grade with either the cuttings or a cement/bentonite grout mixture (if gross contamination is identified). Borings filled with cuttings will be completed to grade using drilling sand, if necessary. The borings will be patched with an asphalt or concrete patch.

3.2 Monitoring Well Installation and Groundwater Sampling

Five of the borings will be converted into two-inch diameter groundwater monitoring wells at the locations indicated on Figure 2 of the RIWP. The wells will be installed to approximately 35 feet bgs and constructed with a 15-foot 20-slot well screen across the water table, sand pack, and j-plug. The wells will be finished with a bentonite seal and grouted to ground surface, with a flush-mount locking well cover. The wells will be developed immediately following installation until the groundwater is clear. Representative groundwater samples will be collected using low-flow sampling techniques (e.g., a peristaltic pump and dedicated Teflon tubing) one to two weeks after installation. Wells will be gauged with a water level meter to record a depth to groundwater (1/100 foot), and an interface meter to determine the presence/thickness of any non-aqueous free-phase petroleum product.

Groundwater samples will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, TAL metals (both total and dissolved analysis) by EPA Methods 6010 and 7471, pesticides by EPA Method 8081, and PCBs by EPA Method 8082. All samples will be analyzed by a NYSDOH ELAP-certified laboratory providing Category B deliverables. One field blank, one blind duplicate, and one MS/MSD sample will be collected for QA/QC purposes and analyzed for the same parameters. In addition, one laboratory-supplied aqueous trip blank will accompany the sample shipment, analyzed for VOCs only.

3.3 Soil Vapor Point Installation

Soil vapor samples will be collected using a dedicated stainless steel probe, consisting of a drive point and internal perforated sampling port with a retractable tip, connected to Teflon sampling tubing. The tubing will extend from the sampling port through a drive casing to above grade. Collectively, the retractable tip, sampling port and sampling tube are referred to as the “soil vapor sampler”. The soil vapor sampler will be installed as follows:

1. Attach new, clean $^{3}/_{16}$-inch inside diameter Teflon tubing to the sampling probe.
2. Drive the sampling probe and attached tubing to a depth of 16 feet below grade.
3. Backfill around the sample port with 2-inches of clean sand filter pack to prevent intake clogging.
4. Retract the drive casing to expose the perforated sampling port.
5. Record total depths (interval below grade) to which probe is advanced and withdrawn for sample collection.
6. Seal the annulus to the surface (between the subsurface/building concrete slab and tubing) by placement of portland cement or hydrated bentonite.

3.4 Decontamination of Sampling Equipment

All non-disposable sampling equipment (Geoprobe rods, macro core samplers, sampling spoons, etc.) will be either dedicated or decontaminated between sampling locations. The decontamination procedure will be as follows:

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

Decontamination will be conducted in 5-gallon buckets. Decontamination waste will be handled as described in Section 3.5.

3.5 Management of Investigation Derived Waste

Investigation derived wastes (IDW) will be minimized by returning excess soil from borings to its original location unless grossly contaminated, per DER-10(3.3)(e). Decontamination fluids will be discharged to the ground unless gross contamination is identified. If gross contamination is identified, those materials will be drummed and staged near the point of generation, and will be properly disposed of based on laboratory results. If free of visible contamination, disposable personal protective equipment (PPE) and sampling equipment (scoops, gloves, rope, etc.) will be placed in heavy-duty plastic bags and disposed of as general refuse.

4.0 SAMPLING AND LABORATORY PROCEDURES

4.1 Soil Sampling

Soil sampling will be conducted according to the following procedures:

1. Characterize the sample according to the modified Burmister soil classification system.
2. Field screening for evidence of contamination (i.e., odors, staining, or elevated PID measurements). Create small holes in the core at one-foot intervals using a sampling spoon (or similar) and place the PID probe in the hole to obtain an organic vapor measurement.
3. After selecting which intervals will be analyzed in the laboratory, fill the required laboratory-supplied sample jars with the soil from the selected sampling depth. Seal and label the sample jars as described in Section 4.5 of this QAPP and place in an ice-filled cooler.
4. Decontaminate any sampling equipment between sample locations as described in Section 3.4 of this QAPP.
5. Record boring number, sample depth and sample observations (e.g., evidence of contamination, PID readings, soil classification) in field log book and on boring log data sheet, if applicable.

4.2 Soil Vapor Sampling

The soil vapor sampling (and concurrent ambient air sampling) will be conducted using 6-liter batch-certified Summa canisters equipped with 2-hour flow controllers. Soil vapor samples will be collected using the following procedures

4.2.1 Sample Set-up

1. Place a plastic bucket over the sampling point. Place a ring-shaped rubber mat with the same diameter as the bucket between the rim of the bucket and the floor/ground surface to create a seal. Place a weight on top of the bucket to reinforce the seal. Pull the Teflon soil gas

sampling tubing through a pre-drilled hole (same diameter as the tubing) on the top of the bucket to allow for sampling collection.

2. Insert a new piece of Teflon tubing through a second close-fitting pre-drilled hole in the side of the bucket. Connect the other end of the new tubing to a helium tank/canister.
3. Connect new flexible hose to a peristaltic pump and connect the Teflon sample tubing to the hose. Connect the other end (discharge end) of the flexible tubing to a 0.5-liter Tedlar bag. Purge the soil vapor sampler of approximately three sampler volumes (0.5 liters) by activating the pump to fill the Tedlar bag to near capacity. The air withdrawal flow rate will be 0.2 liters/minute or less.
4. During purging, helium gas will be introduced into the bucket. The Tedlar bag will be monitored using a Marks Model 9822 helium detector (or equivalent) to check for short-circuiting of outside air into the sampling port. If helium is detected at a concentration greater than 10 percent, then the soil gas point will be resealed with hydrated bentonite. The point will then be retested to ensure that concentration is less than 10 percent.
5. After confirming a proper seal, disconnect the sample tubing from the peristaltic pump and connect it to the inlet of a labeled 6-liter Summa canister.
6. Repeat procedure for all sampling locations.

4.2.2 Sample Collection

1. After Summa canisters are set up at each sampling location, open the valve of each canister and record the time and initial vacuum reading in the field book.
2. After two hours, close the valves, remove the flow-rate controllers and vacuum gauges, install caps on canisters, and record the time and vacuum readings.
3. Place canisters in shipping containers for transportation to laboratory.
4. Repeat procedure for all sampling locations.

4.2.3 Ambient Air Sampling

1. The ambient air sampling is to be conducted concurrently with the soil vapor sampling.
2. Place a labeled 6-liter Summa canister on the ground at a nearby upwind location.
3. Open the valve of the canister and record the time and initial vacuum reading in the field book. After two hours, close the valve, remove flow-rate controller and vacuum gauge, install cap on canister, and record time/vacuum reading.
4. Place canister in shipping container for transportation to laboratory.

4.2.4 Restoration

1. After all soil vapor samples have been collected, pull the sample tubing from the ground and backfill and voids using drilling sand.
2. Patch the borings at the surface with the appropriate materials (e.g., asphalt or concrete).

4.3 Laboratory Methods

Table 1 summarizes the laboratory methods that will be used to analyze field samples as well as the sample container type, preservation, and applicable holding times. An ELAP Certified laboratory will be used for all chemical analyses in accordance with DER-10 2.1(b) and 2.1(f), including Category B Deliverables.

Table 1
Laboratory Analytical Methods for Analysis Groups

Matrix	Analysis	EPA Method	Bottle Type	Preservative	Hold Time
Soil	VOCs	8260	Encore sampler (3) or Terracore Sampler (1)	4°C 0°C within 24 hrs	48 hours to extract 14 days to analyze
	SVOCs	8270	Glass 8 oz. Jar	4°C	14 days to extract 40 days to analyze
	TAL Metals	6000/7000	Glass 8 oz. Jar	4°C	6 months (28 days for Hg)
	Pesticides	8081	Glass 8 oz. Jar	4°C	14 days to extract 40 days to analyze
	PCBs	8082	Glass 8 oz. Jar	4°C	14 days to extract 40 days to analyze
Groundwater	VOCs	8260	40 mL glass vial, septa top	4°C, HCl	14 days
	SVOCs	8270	Glass 1L bottle – TFE cap	4°C	7 days
	TAL Metals	6000/7000	Plastic 500 ml Bottle	4°C	180 days/Hg 28 days
	Pesticides	8081	Glass 1L bottle – TFE cap	4°C	7 days
	PCBs	8082	Glass 1L bottle – TFE cap	4°C	7 days
Soil Vapor/ Ambient Air	VOCs	TO-15	6L Summa Canisters	None	30 days

4.4 Quality Control Sampling

In addition to the laboratory analysis of the investigative soil samples, additional analyses will be included for quality control measures, as required by the Category B protocols. These samples will include field blanks, trip blanks, matrix spike/matrix spike duplicates (MS/MSD), and duplicate/blind duplicate samples at a frequency of one sample per 20 field samples. Table 2 provides a summary of the field samples and QA/QC samples.

Table 2
Field Sample and QC Sample Quantities

Sample Type	Parameters	EPA Method[1]	Field Samples	QC Samples			
				Field Blank[2]	Trip Blank[2]	MS/MSD[2]	Duplicate[2]
Soil	VOCs	EPA 8260	28	2	1	2	2
	SVOCs	EPA 8270	28	2	--	2	2
	TAL Metals	EPA 6000/7000	28	2	--	2	2
	Pesticides	EPA 8081	28	2	--	2	2
	PCBs	EPA 8082	26	2	--	2	2
Groundwater	VOCs	EPA 8260	5	1	1	1	1

	SVOCs	EPA 8270	5	1	--	1	1
	TAL Metals	EPA 6000/7000	5	1	--	1	1
	Pesticides	EPA 8081	5	1	--	1	1
	PCBs	EPA 8082	5	1	--	1	1

Notes:
MS/MSD - matrix spike/matrix spike duplicate
[1] NYSDEC Category B deliverables
[2] One QC sample per twenty field samples or sample shipment

4.5 Sample Handling

4.5.1 Sample Identification

All samples will be consistently identified in field documentation, chain-of-custody documents and laboratory reports using an alpha-numeric system. Soil samples will be identified by the soil boring number followed by the sample depth interval (in parentheses). Groundwater samples will be identified by the monitoring well number. Soil vapor samples will be identified by the sampling point number, and the ambient air sample will be identified as “AA”.

The field duplicate sample will be labeled with a dummy location to ensure that it is blind to the laboratory. The dummy identification will include the sample type followed by a letter. For duplicate soil boring samples, the sample depth will be the actual depth interval. Trip blanks and field blanks will be identified as “TB” and “FB”, respectively.

Table 3 provides examples of the sampling identification scheme:

Table 3
Examples of Sample Names

Sample Description	Sample Designation
Soil sample collected from 0 to 2 feet at boring SB-20	SB-20 (0-2)
Groundwater sample collected from monitoring well MW-20	MW-20
MS/MSD duplicate sample from MW-21	MW-21-MS
Duplicate soil sample from 16 to 18 feet at SB-23	SB-23A (16-18)
Soil vapor sample collected from sampling point SV-20	SV-20
Ambient air sample	AA

4.5.2 Sample Labeling and Shipping

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

- Project identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed

- Sampler's initials

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

The samples will be prepared for shipment by placing each jar/container in a sealable plastic bag, then wrapping with bubble wrap to prevent breakage, adding freezer packs and/or fresh ice in sealable plastic bags and the chain-of-custody (COC) form. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with tape and a COC seal to ensure that the coolers remain sealed until delivery.

4.5.3 Sample Custody

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

4.6 Field Instrumentation

Field personnel will be trained in the proper operation of all field instruments before the start of the field program. Instruction manuals will be on file at the site for referencing proper operation, maintenance and calibration procedures. The equipment will be calibrated according to manufacturer specifications (typically 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/time of each calibration, any failure to calibrate and corrective actions taken. The PID will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas.

4.7 Data Review

In accordance with DER-10, each of the samples collected as part of the RI will undergo third party review to ensure usability. Data usability summary reports documenting any QA/QC issues will be included in the RI Report.

ATTACHMENT A

RESUME OF PROJECT QA/QC OFFICER, PROJECT DIRECTOR, AND PROJECT MANAGER

AXEL E. SCHWENDT

PROFESSIONAL GEOLOGIST

Mr. Schwendt is a Technical Director geologist for AKRF and has 15 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.

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

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.

RELEVANT EXPERIENCE

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 and convert the food waste into 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 (Phase I 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 it's 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 preparation of 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).

E-Designated Properties, New York City, NY

Mr. Schwendt has assisted various public and private clients with addressing E-Designations assigned by NYCDEP to properties throughout New York City. He has prepared the required Phase I ESAs and, if warranted, implemented Phase II testing to the satisfaction of NYCDEP. 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 NYCDEP, 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 received the Notice of Satisfaction necessary to acquire building permits from the New York City Department of Buildings (DOB).

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 a 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 NYSDEC to properly investigate and close out the tanks. The tank farm includes seventeen (17) 550-gallon gasoline USTs and one (1) 550-gallon waste oil UST. Mr. Schwendt also managed the closure of the 18 USTs to the satisfaction of the NYSDEC.

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 a Preliminary Environmental Site Assessment (PESA) for the whole project area and more than 25 individual Phase I ESAs for properties within the site boundaries. In addition, Mr. Schwendt conducted a subsurface investigation at the site to characterize the subsurface conditions and used 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 proposed project, which was approved by NYCDEP.

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

Mr. Schwendt managed the preparation of Phase I ESAs and Phase II Investigations, along with the hazardous materials chapters for EISs for properties owned or to be acquired by LIPA to identify potential sources of environmental contaminants prior to power station and power line installation.

Storage Deluxe, Various Locations, NY

Mr. Schwendt is currently the project manager assisting Storage Deluxe with the ongoing expansion of their self-storage facilities located primarily in New York City's five boroughs and in Westchester County. He manages environmental due diligence needs related to their property transactions and conducts analyses as needed, including Phase I 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 preparing Phase I 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.

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. Mr. Schwendt was involved with the completion of the Environmental Impact Statement and conducted a Phase I ESA and Phase II Subsurface Investigation for the proposed 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.

Kings Plaza, LLC Total Energy Plant, Brooklyn, NY

Mr. Schwendt conducted an environmental compliance review of the Kings Plaza Total Energy Plant (TEP) in Brooklyn, New York. Mr. Schwendt observed operations and reviewed 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 associated with facility operations and prepared a Spill Control Prevention and Countermeasure Plan (SPCC Plan) for the facility.

St. George Ferry Terminal, Staten Island, NY

Mr. Schwendt prepared a Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) for the Department of Transportation (DOT) St. George Ferry Terminal facility in Staten Island. The facility houses various bulk containers which 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 advised the DOT on how to upgrade the facility's fueling systems to comply with the SPCC and NYSDEC regulations.

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.

MARCUS SIMONS

SENIOR VICE PRESIDENT

Marcus Simons is a Senior Vice President of AKRF with 20 years of environmental consulting experience, specializing in the assessment and cleanup of contaminated sites, including federal and state superfund, RCRA, TSCA, brownfield, voluntary cleanup and spill sites. His expertise includes health risk assessment, development of sampling plans, economic evaluations of remedial alternatives, and regulatory analysis. He is also AKRF's Health and Safety Officer with extensive experience of Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) issues during sampling and remediation of contaminated sites.

Mr. Simons directs much of AKRF environmental due diligence work (recently managing environmental due diligence on Tishman/Blackrock's Peter Cooper/Stuyvesant Town acquisition, reportedly the largest real estate transaction in US history), including supervising preparation of numerous Phase I and Phase II Environmental Site Assessments, as well as more complex multi-site and litigation-related projects. Mr. Simons manages preparation of the contaminated-materials portions of AKRF's Environmental Impact Statements and Environmental Assessments and has experience with procedures for hazardous material requirements under NEPA and New York SEQRA/CEQR and E-designation programs. He also has extensive experience in statistics, selection of sites for controversial facilities, and federal and state wetland regulations and waterfront permitting. In addition to analytical work, Mr. Simons has considerable experience in presenting results to regulatory agencies and the general public.

BACKGROUND

Education

M.S., Engineering and Public Policy, Carnegie-Mellon University, 1988

M.A. and B.A. (Honors), Mathematics/Engineering, Cambridge University, England, 1986

Certifications

Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) – 40 Hour Site Worker and 8 Hour Site Supervisor

Years of Experience

Year started in company: 1995

Year started in industry: 1988

Mr. Simons has managed some of the most complex cleanup sites in New York State including: the recently completed cleanup of a 12-acre PCB-contaminated former utility property in Flushing, Queens where a 3 million square foot retail/residential building is nearing completion (remediation was performed under the State Brownfield Cleanup Program, though the site was also subject to City jurisdiction under its E-Designation program); cleanup of the nation's largest former dental factory in Staten Island for reuse as single family housing; the investigation of several former manufactured gas plants; and the investigation and remediation associated with the reconstruction of the West Side Highway and Hudson River Park in Manhattan (from the Battery to 59th Street). Mr. Simons also has extensive experience with transportation projects (Second Avenue Subway, MTA/LIRR East Side Access, Cross Harbor Freight Movement Study, Route 9A Reconstruction), large-scale rezoning projects (Long Island City, Downtown Brooklyn, Jamaica) and public and private redevelopment work (Atlantic Yards, School Construction Authority, Queens West).

RELEVANT EXPERIENCE

CE Flushing Site, Flushing, NY

Mr. Simons directed the remediation of a former industrial site in Flushing, Queens, NY prior to its redevelopment as a 3 million square foot retail/residential complex. The property was cleaned up under the NYS Department of Environmental Conservation Brownfield Cleanup Program and the NYC Department of Environmental Protection's E-Designation requirements. The remedial measures included the removal of aboveground and underground storage tanks, excavation and off-site disposal of TSCA, RCRA and non-hazardous wastes, NAPL removal, and removal and investigation of on-site drainage structures. The remediation and subsequent construction involved obtaining (or obtaining waivers from) numerous permits including those for NYSDEC Tidal Wetlands, NYSDEC Long Island Wells, NYSDEC SPDES/Stormwater and NYCDEP Sewer Use.

Peter Cooper Village/Stuyvesant Town, New York, NY

Mr. Simons directed the purchaser's environmental due diligence efforts for the bidding and subsequent acquisition of this 80-acre property in Manhattan. Much of the 110-building complex is underlain by former manufactured gas plants and Con Edison entered the site into NYSDEC's Voluntary Cleanup Program. Going forward Mr. Simons will manage oversight of activities that involve disturbance of MGP-contaminated soils, as well as future testing and potentially remediation.

MTA New York City Transit Manhattan East Side Transit Alternative (MESA)/Second Avenue Subway, New York, NY

Mr. Simons directed the contaminated material assessment for this multi-billion dollar transit initiative that would provide subway service to Manhattan's East Side. The assessment identified several hundred facilities along the alignment that could have impacted soil and/or groundwater and could require special materials handling and enhanced health and safety procedures. Additional evaluation of these sites is underway.

Ferry Point Park, Bronx, NY

Mr. Simons developed the material acceptance criteria (soil standards for capping materials) for the development of Ferry Point Park (including a golf course) in the Bronx. The New York City Department of Environmental Protection DEP and the New York State Departments of Health (DOH) and Environmental Conservation (DEC) agreed for the first time to relax their strict (TAGM 4046) criteria for clean soil, based on statistical analyses of background conditions and risk-based modeling.

Prince's Point, Staten Island, NY

Mr. Simons managed the complex cleanup (including the relocation of a contaminated tidal creek) of the nation's largest former dental factory site on Staten Island's waterfront. The site was on the State Superfund list. The future use of the site as single-family residential property entailed extensive negotiations with NYSDEC and NYSDOH. The project required obtaining (or obtaining waivers from) numerous permits including those for NYSDEC Tidal and Fresh Water Wetlands, USACOE (Nationwide) Permits, NYSDEC Coastal Erosion Hazard Area, NYSDEC SPDES and Stormwater, FEMA Modifications to Land in Floodplain, and USEPA Notification of PCB Waste Activity.

Route 9A Reconstruction, New York, NY

AKRF directed extensive studies for the reconstruction in Lower Manhattan proposed by the New York State Department of Transportation (NYSDOT) in cooperation with the Federal Highway Administration (FHWA). The project is arguably the most complex environmental analyses performed for a federally funded transportation project in New York City in the last 10 years. The firm was responsible for all environmental tasks as well as the preparation for the Draft, Supplementary, and Final Environmental Impact Statements (EISs) and Section 4(f) Evaluation for this 5-mile $250 million reconstruction of Route 9A as part of the recovery effort following the events of September 11th, 2001. Mr. Simons managed the extensive hazardous materials investigations and prepared the contract specifications for contaminated soil and tank removal, including Health and Safety oversight.

Hudson River Park, New York, NY

Mr. Simons is managing hazardous materials issues for the ongoing Hudson River Park construction, located adjacent to the Route 9A roadway. Construction is ongoing and Mr. Simons directs health and safety oversight and remediation during construction.

Jamaica Rezoning, Queens, NY

As part of the preparation of an Environmental Impact Statement, Mr. Simons managed the hazardous materials assessment of a multi-block area. In addition to conducting the assessment, Mr. Simons made recommendation as to the properties where “E-Designations” (city-recorded institutional controls on future development) should be placed.

Outlet City, Long Island City, Queens, NY

In Long Island City, Mr. Simons managed the investigation and interim remediation of an old factory complex where large volumes of creosote were spilled. The investigations and interim remedial measures (IRMs) took place under the New York State’s Voluntary Cleanup Program (VCP).

MTA/LIRR East Side Access Project, New York, NY

Mr. Simons managed the hazardous materials investigations for multiple sites in the Bronx, Manhattan, and Queens associated with the Environmental Impact Statement (EIS) for the Long Island Rail Road connection to Grand Central Terminal. Mr. Simons continues to be involved in health and safety oversight related to the construction of the project.

New York City Department of Transportation, Lead Paint Removal and Disposal on Bridges Project, New York, NY

Mr. Simons conducted a regulatory analysis of related to the removal of lead paint from nearly 800 bridges. This analysis included an evaluation of the regulatory compliance of various proposed procedures with federal and state hazardous and solid waste management requirements.

American Felt and Filter Company, New Windsor, NY

Mr. Simons prepared a Remedial Investigation (including exposure assessment) and Feasibility Study for the country’s oldest active felt manufacturing facility, located in Orange County. This solvent-contaminated site is on the State Superfund List.

NEOMA CHEFALO

ENVIRONMENTAL SCIENTIST

Neoma Chefalo is an Environmental Scientist with experience in Due Diligence Phase I and Phase II Environmental Site Assessments (ESAs) and National Environmental Policy Act (NEPA) screenings, Lab Pack Chemistry, environmental consulting, environmental sciences and project management. Ms. Chefalo has technical experience in Phase I ESAs, historical land-use research, Section 106 surveys, NEPA screenings, Phase II ESAs, asbestos and lead-based paint testing, environmental inspections, governmental file reviews, and soil and groundwater sampling investigations. Ms. Chefalo also has experience in the environmental field including NEPA screenings, Phase I and Phase II ESAs of historic, commercial, industrial and residential properties, asbestos surveys, and soil and groundwater sampling programs. In addition, Ms. Chefalo has experience with Section 106 surveys.

BACKGROUND

Education

B.A., Environmental Studies, University of San Francisco, 2003

Certifications

Section 106 and NEPA Training

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

New York State Asbestos Inspector

RELEVANT EXPERIENCE

New York City School Construction Authority, Various Locations, New York City

Under an on-call contract, AKRF provides the New York City School Construction Authority (NYCSCA) with hazardous materials consulting services. Ms. Chefalo is involved with various due diligence and environmental assessment projects including Phase I Environmental Site Assessments (ESAs); Phase II (Subsurface) Environmental Site Investigations (soil, groundwater and soil gas investigations); Indoor Air Quality (IAQ) Assessments; Underground Storage Tank (UST) inspections; and peer review of consultant due diligence reports.

Rockaway Turnpike, Lawrence, Nassau County, NY

Ms. Chefalo provided oversight for tank removal/closure activities and subsequent soil and groundwater sampling with regulatory spill closure procedures for this former gasoline filling station.

2477 Third Avenue, Bronx, NY

Ms. Chefalo conducted a Phase I Environmental Site Assessment (ESA) and a subsequent Phase II Environmental Site Investigation including soil and groundwater sampling for this former gasoline filling station, which was entered into New York's Brownfield Cleanup Program (BCP). Ms. Chefalo also assisted with the BCP application process for the facility.

Hudson River Park, New York, NY

AKRF serves as an on-call 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. Ms. Chefalo conducts environmental construction monitoring and subsurface investigations, provides guidance on construction and environmental health and safety issues, interfaces with regulatory agencies as necessary, and oversees tank removals and the mitigation of environmental conditions encountered during site development activity.

Weill Cornell Medical Center Ambulatory Care Facility, New York, NY

AKRF prepared an Environmental Assessment Statement (EAS) and supplemental studies for a new Ambulatory Care Facility at Cornell University's Joan and Sanford I. Weill Medical College (WMC) in Manhattan. The college requested several variances (rear yard, sky exposure plane, lot coverage, and transfer of floor area across zoning district boundaries) from the New York City Board of Standards and Appeals (BSA) to facilitate construction of a new facility on the southwest corner of East 70th Street and York Avenue. Ms. Chefalo conducted a Phase I Environmental Site Assessment (ESA) and authored the hazardous materials chapter of the EAS.

Pedestrian Bridges Reconstruction Project, New York, NY

The New York City Department of Design and Construction (DDC) hired AKRF to provide environmental consulting services. Ms. Chefalo conducted a Phase I Environmental Site Assessment (ESA) and wrote the hazardous materials chapter of the Environmental Impact Statement (EIS) for the reconstruction of two Americans with Disabilities Act (ADA) compliant pedestrian bridges.

The New School Reconstruction, New York, NY

Ms. Chefalo conducted a Phase I Site Assessment (ESA) and wrote the hazardous materials chapter of a study for the reconstruction of this educational facility.

677 11th Avenue, New York, NY

Rockrose Development hired AKRF to provide environmental consulting services. Ms. Chefalo conducted a Phase I Environmental Site Assessment (ESA) and Phase II Sub-slab soil gas monitoring of this auto repair and storage facility.

55 Water Street, New York, NY

Goldman Sachs constructed a 53-story trading facility in Lower Manhattan. While with another firm, Ms. Chefalo conducted a Phase I Environmental Site Assessment (ESA) and National Environmental Policy Act (NEPA) land use screening for this project.

ADRIANNA BOSCO

PROFESSIONAL I

Adrianna Bosco is a Professional I in AKRF's Hazardous Materials Department. She has experience in Phase I and Phase II site investigations and remediation/construction monitoring and oversight. Ms. Bosco is a 2011 graduate of Manhattan College, where she studied Environmental Engineering. She worked as an Environmental Scientist for PS&S Engineering, Inc. prior to joining AKRF.

BACKGROUND

Role in Project

Junior Environmental Scientist

Education

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

Licenses/Certifications

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

Years of Experience

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

RELEVANT EXPERIENCE

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

Before joining AKRF, Ms. Bosco was an Environmental Scientist I in the Environmental Department at PS&S. She was responsible for conducting site investigations and providing construction oversight for remediation projects in New York and New Jersey. As a staff scientist, she was responsible for the on-site supervision of subcontractors and interacting with project managers and client representatives. Ms. Bosco also prepared technical reports, work plans, monitoring logs, and Phase I Environmental Site Assessments (ESAs).

Former Laundry/Dry Cleaning Plant, Harlem, New York

This former dry cleaning property, now a privately owned commercial facility, is the only New York State Department of Environmental Conservation's (NYSDEC) listed hazardous waste site in Manhattan. The final Remedial Action Work Plans (RAWPs) for the site were approved in 2012 and 2013. Remedial work includes removal of contaminated building materials, installation of a soil vapor extraction (SVE) system and sub-slab depressurization system (SSDS), and in-situ soil and groundwater treatment with chemical-oxidation injection. Ms. Bosco performed remedial action oversight, including SSDS piping installation inspections and Health and Safety Plan (HASP) air monitoring for volatiles and particulates.

Soundview Park, Bronx, NY

This project consists of reconstruction and enhancement of a 205-acre park in the Bronx. The site was historically a landfill and later backfilled with sanitation fill material prior to park construction. Remediation of this site included the excavation and disposal of contaminated soil and placement of clean fill. Ms. Bosco performed environmental monitoring in compliance with the Construction Health and Safety Plan (CHASP) and Remedial Action Plan (RAP) during the excavation and disposal of historic fill and solid waste. She was also responsible for conducting air quality monitoring for volatiles and particulates during all soil disturbance activities.

145 West Street, Greenpoint, Brooklyn, NY

Investigation and remediation of this site of a proposed high-rise residential building on the Greenpoint waterfront is being conducted under the NYSDEC Brownfield Cleanup Program (BCP), and remediation for redevelopment will also be conducted under New York City Office of Environmental Remediation (OER) as the site lots have an E Designation for hazardous materials. For this project, Ms. Bosco conducted a Supplemental Site Investigation to determine the feasibility of achieving a BCP "Track 1" clean-up. The investigation included advancement of soil borings within the proposed building footprints and adjacent to a fuel oil UST; installation of a monitoring well adjacent to the UST; and collection of soil and groundwater samples for waste characterization and delineation of petroleum contamination.

APPENDIX B

HEALTH AND SAFETY PLAN

The Crossing at Jamaica Station

QUEENS, NEW YORK

Health and Safety Plan

AKRF Project Number: 12146

NYSDEC Site Number: TBD

Prepared for:

BRP Development Corp.
767 Third Avenue, 33rd Floor
New York, New York, 10017

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
646-696-0670

FEBRUARY 2016

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1.0 INTRODUCTION

The Crossing at Jamaica Station site is located in the Jamaica section of Queens, New York. The approximately 1.57-acre site, also identified as Block 9998, Lot 83, is hereafter referred to as the "Site." The Site is bounded by Archer Avenue to the north, followed by commercial and industrial uses; a commercial building to the east; the Long Island Rail Road (LIRR) to the south, and Sutphin Boulevard to the west, followed by the LIRR. Properties in the surrounding areas consist of predominately industrial and commercial properties, with some residencies further north and south.

Historical reports indicated that the southwestern and central portions of the Site included a filling station, a garage, a kitchen cabinet manufacturer, and a garage door company with two buried gasoline storage tanks between 1942 and 1951, unspecified commercial uses, and automotive repair shops between 1981 and 2007. The eastern portion of the Site historically had residential, commercial, and religious uses.

AKRF has prepared a Remedial Investigation Work Plan (RIWP) to further characterize soil and soil vapor conditions. The RI will include installation of soil borings, monitoring wells, and soil vapor monitoring points, with collection of soil, groundwater, and soil vapor samples for laboratory analysis. This Heath and Safety Plan (HASP) has been designed to ensure workplace safety while completing the RI.

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	( ) Lab
( ) Caustics	( ) Asbestos	( ) Metals	(**X**) Petroleum	( ) Other DF	( ) Pharm
( ) Pesticides	( ) Tailings	( ) POTW	(**X**) Other Chlorinated Organic Solvents	( ) Motor or Hydraulic Oil	( ) Hospital
(**X**)Petroleum	(**X**) Other	( ) Other		(**X**) Gasoline	( ) Rad
( ) Inks	Fill material			(**X**) Fuel Oil	( ) MGP
( ) PCBs				(**X**) Waste Oil	( ) Mold
(**X**) Metals					( ) Cyanide
(**X**)Other: SVOCs					

2.1.4 Chemicals of Concern

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
Tetrachloroethylene	REL = Lowest possible PEL = 100 ppm STEL = 100 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination, headache, drowsiness, skin erythema (skin redness), and liver damage.
Trichloroethylene	REL = 25 ppm PEL = 100 ppm	Headaches, lung irritation, dizziness, poor coordination, impaired heart function, unconsciousness, and nerve, kidney and liver damage.
1,2 Dichloroethene	REL = 200 ppm PEL = 200 ppm	Nausea, drowsy, tiredness possible heart damage.
1,1 Dichloroethane	REL = 100 ppm PEL = 100 ppm	Irritation skin; central nervous system depression; liver, kidney, lung damage
1,1,1 Trichloroethane	REL = 350 ppm PEL = 350 ppm	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage
Arsenic	REL= 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]
Lead	REL= 0.1 mg/m^3 PEL= 0.05 mg/m^3	Weak, lassitude, insomnia; facial pallor, pale eye, anorexia, low-weight, malnutrition, constipation, abdominal pain, colic; anemia; gingival lead line; tremors, paralysis wrists and ankles; encephalopathy; kidney disease; irritation eyes; hypotension.
Mercury	REL= 0.05 mg/m^3 (Hg vapor) REL=0.1 mg/m^3 (other) 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
Benzene	REL = 0.1 ppm PEL = 1 ppm STEL = 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; bone marrow depression, potential occupational carcinogen.
Toluene	REL = 100 ppm PEL = 200 ppm STEL = 300 ppm	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Ethylbenzene	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma.
Xylenes	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, poor coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Polyaromatic Hydrocarbons (PAHs)	REL= 0.1 mg/m^3 PEL= 5 mg/m^3	Harmful effects on the skin, body fluids, and ability to fight disease after both short and long term exposure, birth defects, and potential occupational carcinogen.

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
Comments: REL = NIOSH Recommended Exposure Limit PEL = OSHA Permissible Exposure Limit STEL = OSHA Short Term Exposure Limit		

2.2 Designated Personnel

AKRF will appoint one of its on-site personnel as the Site Safety Officer (SSO). This individual will be responsible for the implementation of the HASP. The SSO will have a 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 perform sampling activities in the work area while intrusive activities are being performed will have completed a 40-hour training course that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. In addition, all personnel will have up-to-date 8-hour refresher training. The training will allow personnel to recognize and understand the potential hazards to health and safety. All field personnel must attend a training program, whose purpose is to:

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

Each member of the field crew will be instructed in these objectives before 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 site activities. The medical release shall consider the type of work to be performed and the required 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 area where support facilities such as vehicles, fire extinguisher, and first aid supplies are located. The emergency staging area (part of the Support Zone) is the area where all workers on-site would assemble in the event of an emergency. A summary of these areas is provided below. These zones may changed by SSO, depending on that day's activities. All field personnel will be informed of the location of these zones before work begins.

Appropriate barriers will be set up to secure the area and prevent any unauthorized personnel from approaching within 15 feet of the work area.

Site Work Zones

Task	**Exclusion Zone**	**CRZ**	**Support Zone**
Soil Borings	15 ft from Drill Rig	25 ft from Drill Rig	As Needed
Soil Vapor Points	15 ft from Drill Rig	25 ft from Drill Rig	As Needed

2.6 Air Monitoring

The purpose of the air monitoring program is to identify any exposure of the field personnel to potential environmental hazards in the soil and soil vapor. Results of the air monitoring will be used to determine the appropriate response action, if needed.

2.6.1 Work Zone Air Monitoring

Real time air monitoring will be performed with a photoionization detector (PID). Measurements will be taken prior to commencement of work and continuously during the work, as outlined in the following table. 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. The PID will be calibrated with 100 parts per million (ppm) isobutylene standard in accordance with the manufacturer's instructions at the start of each work day. 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.

Work Zone Air Monitoring Action Levels

Instrument	**Action Level**	**Response Action**
PID	Less than 10 ppm in breathing zone	Level D or D-Modified
	Between 10 ppm and 500 ppm	Level C
	More than 500 ppm	Stop work. Resume work when readings are less then 500 ppm.

2.6.2 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) Generic

Community Air Monitoring Plan (CAMP). Real-time air monitoring for volatile compounds 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 soil vapor samples. Periodic monitoring may include obtaining measurements upon arrival at a location, when purging a sampling point, and upon leaving the location.

Continuous monitoring for VOCs will be conducted during all ground intrusive activities (i.e., soil boring installation). Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. VOCs will be monitored continuously at the downwind perimeter of the exclusion zone. Monitoring will be conducted with a PID equipped with an 11.7 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 downwind perimeter of the exclusion zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet – is below 5 ppm above background for the 15-minute average.
- If the total organic vapor level is above 25 ppm at the perimeter of the exclusion zone, activities will be shutdown.

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

Major Vapor Emission Response Plan

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

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

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

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

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

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

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

2.6.3 Personal Protection Equipment

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

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

Personal Protection Equipment Requirements		
LEVEL OF PROTECTION & PPE		**All Tasks**
Level D (**X**) Steel Toe Shoes (**X**) Hard Hat (within 25 ft of drill rig/excavator) (**X**) Work Gloves	(**X**) Safety Glasses ( ) Face Shield (**X**) Ear Plugs (within 25 ft of drill rig/excavator) (**X**) Nitrile Gloves (**X**) Tyvek for drill operator if NAPL present	Yes
Level C ***(in addition to Level D)*** (**X**) Half-Face Respirator OR (**X**) Full Face Respirator ( ) Full-Face PAPR	( ) Particulate Cartridge ( ) Organic Cartridge (**X**) Dual Organic/ Particulate Cartridge	If PID > 10 ppm (breathing zone)
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breath or any odors detected).		

2.7 General Work Practices

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

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the site. These areas will be designated by the SSO.
- Workers must wash their hands thoroughly on leaving the work area and before eating, drinking, or any other such activity.
- The workers should shower as soon as possible after leaving the site. Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat/cold stress.

3.0 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN

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

3.1 Hospital Directions

Hospital Name:	Jamaica Hospital Medical Center
Phone Number:	(718) 206-6000
Address/Location:	8900 Van Wyck Expressway, Jamaica, NY 11418
Directions:	Head WEST on Archer Avenue toward Sutphin Boulevard Turn RIGHT onto Sutphin Boulevard Turn LEFT onto Jamaica Avenue Cross over the Van Wyck Expressway and turn immediately LEFT onto Van Wyck Expressway Service Road Emergency room will be on the right between 89th Avenue and 91st Avenue

3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF, Inc.	Axel Schwendt	Project Director	646-388-9529 (office)
	Neoma Chefalo	Project Manager	646-388-9854 (office)
	Adrianna Bosco	SSO	646-388-9576 (office) 914-874-3358 (cell)
BRP Development Corp.	TBD	Owner Representative	TBD

Company	Individual Name	Title	Contact Number
New York State Department of Environmental Conservation	TBD	Project Manager	TBD
New York State Department of Health	TBD	Public Health Engineer	TBD
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 Crossing at Jamaica Station 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: __________

Signed: ___________________________ Company: _________________________ Date: __________

Signed: ___________________________ Company: _________________________ Date: __________

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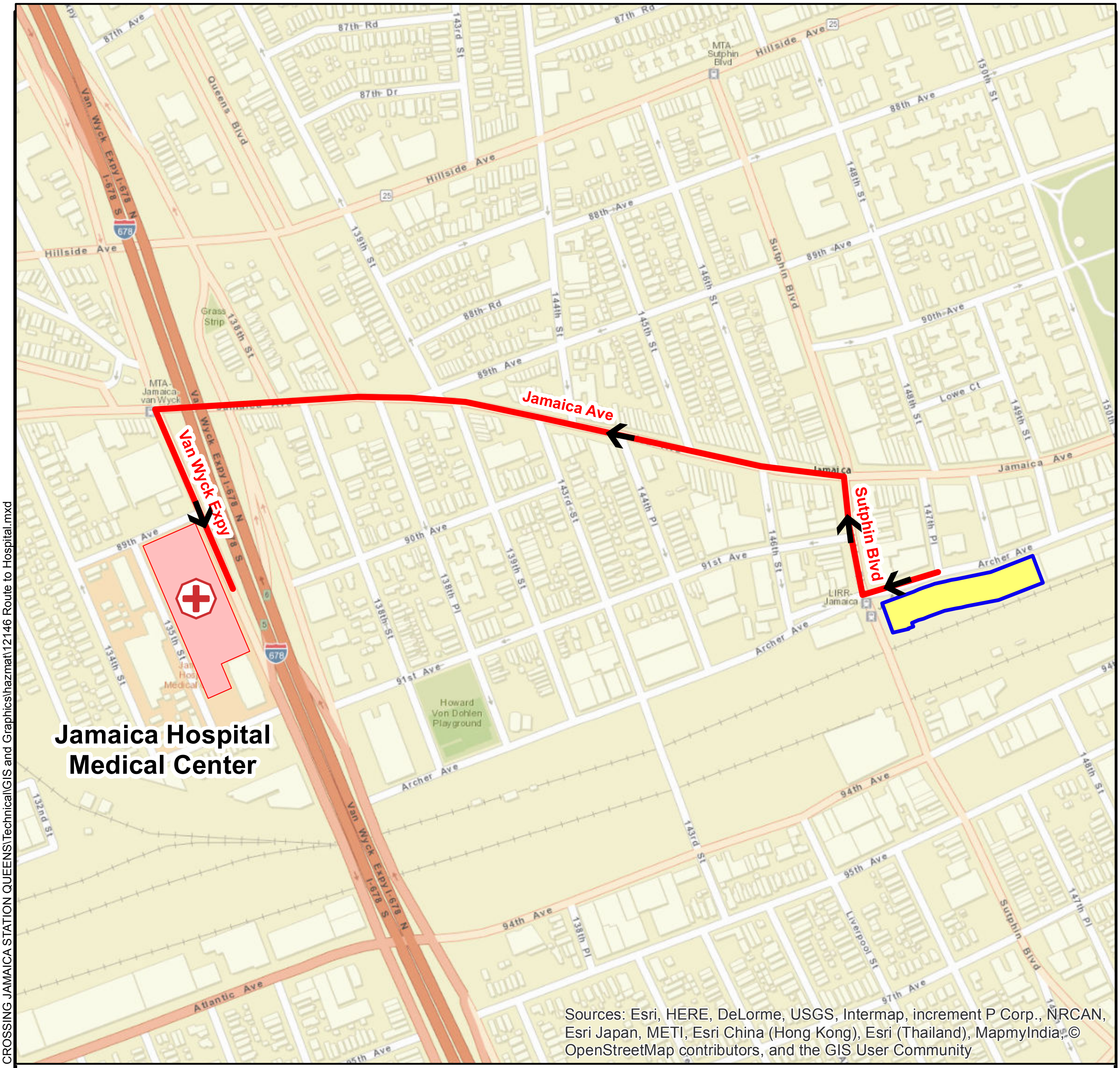
Signed: ___________________________ Company: _________________________ Date: __________

FIGURE 1 – HOSPITAL ROUTE MAP



Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

✚ Hospital Location

🟨 Project Site Location

← Route to Hospital

0 500 1,000 Feet

Jamaica Hosptial Medical Center
8900 Van Wyck Expressway
Jamaica, NY 11418

The Crossing at Jamaica Station
Queens, New York

HOSPITAL LOCATION MAP

AKRF
Environmental Consultants
440 Park Avenue South, New York, N.Y. 10016

DATE
1/25/2016

PROJECT No.
12146

FIGURE
1

ATTACHMENT A

POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

TETRACHLOROETHYLENE
CAS # 127-18-4

Agency for Toxic Substances and Disease Registry ToxFAQs September 1997

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

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

What is tetrachloroethylene?

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

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

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

What happens to tetrachloroethylene when it enters the environment?

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

How might I be exposed to tetrachloroethylene?

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

How can tetrachloroethylene affect my health?

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

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

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

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

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

How likely is tetrachloroethylene to cause cancer?

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

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

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

References

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

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

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

TRICHLOROETHYLENE

CAS # 79-01-6

Division of Toxicology ToxFAQs™ **July 2003**

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

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

What is trichloroethylene?

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

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

What happens to trichloroethylene when it enters the environment?

☐ Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time.

☐ Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air.

☐ Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time.

☐ Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment.

☐ Trichloroethylene does not build up significantly in plants and animals.

How might I be exposed to trichloroethylene?

☐ Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid.

☐ Drinking, swimming, or showering in water that has been contaminated with trichloroethylene.

☐ Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site.

☐ Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment.

How can trichloroethylene affect my health?

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

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

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

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

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

How likely is trichloroethylene to cause cancer?

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

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

Glossary

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

References

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

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

ATSDR
AGENCY FOR TOXIC SUBSTANCES
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1,2-DICHLOROETHENE

CAS # 540-59-0, 156-59-2, and 156-60-5

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

This fact sheet answers the most frequently asked health questions (FAQs) about 1,2-dichloroethene. 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: Exposure to 1,2-dichloroethene occurs mainly in workplaces where it is made or used. Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired. *cis*-1,2-Dichloroethene has been found in at least 146 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA). *trans*-1,2-Dichloroethene was found in at least 563 NPL sites. 1,2-Dichloroethene was found at 336 sites, but the isomer (*cis*- or *tran*s-) was not specified.

What is 1,2-dichloroethene?

(Pronounced 1,2-dī-klôr′ ō-ĕth′ēn)

1,2-Dichloroethene, also called 1,2-dichloroethylene, is a highly flammable, colorless liquid with a sharp, harsh odor. It is used to produce solvents and in chemical mixtures. You can smell very small amounts of 1,2-dichloroethene in air (about 17 parts of 1,2-dichloroethene per million parts of air [17 ppm]).

There are two forms of 1,2-dichloroethene; one is called *cis*-1,2-dichloroethene and the other is called *trans*-1,2-dichloroethene. Sometimes both forms are present as a mixture.

What happens to 1,2-dichloroethene when it enters the environment?

- 1,2-Dichloroethene evaporates rapidly into air.
- In the air, it takes about 5-12 days for half of it to break down.
- Most 1,2-dichloroethene in the soil surface or bodies of water will evaporate into air.
- 1,2-Dichloroethene can travel through soil or dissolve in water in the soil. It is possible that it can contaminate groundwater.
- In groundwater, it takes about 13-48 weeks to break down.
- There is a slight chance that 1,2-dichloroethene will break down into vinyl chloride, a different chemical which is believed to be more toxic than 1,2-dichloroethene.

How might I be exposed to 1,2-dichloroethene?

- Breathing 1,2-dichloroethene that has leaked from hazardous waste sites and landfills.
- Drinking contaminated tap water or breathing vapors from contaminated water while cooking, bathing, or washing dishes.
- Breathing 1,2-dichloroethene, touching it, or touching contaminated materials in the workplace.

How can 1,2-dichloroethene affect my health?

Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired; breathing very high levels can kill you.

When animals breathed high levels of *trans*-1,2-dichloroethene for short or longer periods of time, their livers and lungs were damaged and the effects were more severe with longer exposure times. Animals that breathed very high levels of *trans*-1,2-dichloroethene had damaged hearts.

Animals that ingested extremely high doses of *cis*- or *trans*-1,2-dichloroethene died.

Lower doses of *cis*-1,2-dichloroethene caused effects on the blood, such as decreased numbers of red blood cells, and also effects on the liver.

The long-term (365 days or longer) human health effects after exposure to low concentrations of 1,2-dichloroethene aren't known. One animal study suggested that an exposed fetus may not grow as quickly as one that hasn't been exposed.

Exposure to 1,2-dichloroethene hasn't been shown to affect fertility in people or animals.

How likely is 1,2-dichloroethene to cause cancer?

The EPA has determined that *cis*-1,2-dichloroethene is not classifiable as to its human carcinogenicity.

No EPA cancer classification is available for *trans*-1,2-dichloroethene.

Is there a medical test to show whether I've been exposed to 1,2-dichloroethene?

Tests are available to measure concentrations of the breakdown products of 1,2-dichloroethene in blood, urine, and tissues. However, these tests aren't used routinely to determine whether a person has been exposed to this compound. This is because after you are exposed to 1,2-dichloroethene, the breakdown products in your body that are detected with these tests may be the same as those that come from exposure to other chemicals. These tests aren't available in most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum allowable level of *cis*-1,2-dichloroethene in drinking water at 0.07 milligrams per liter of water (0.07 mg/L) and *trans*-1,2-dichloroethene at 0.1 mg/L.

The EPA requires that any spills or accidental release of 1,000 pounds or more of 1,2-dichloroethene must be reported to the EPA.

The Occupational Health Safety and Health Administration (OSHA) has set the maximum allowable amount of 1,2-dichloroethene in workroom air during an 8-hour workday in a 40-hour workweek at 200 parts of 1,2-dichloroethene per million parts of air (200 ppm).

Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Fertility: Ability to reproduce.

Ingest: To eat or drink something.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Solvent: A chemical that can dissolve other substances.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for 1,2-Dichloroethene produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

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

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BENZENE
CAS # 71-43-2

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

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

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

What is benzene?
(Pronounced bĕn′zēn′)

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

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

What happens to benzene when it enters the environment?

- Industrial processes are the main source of benzene in the environment.
- Benzene can pass into the air from water and soil.
- It reacts with other chemicals in the air and breaks down within a few days.
- Benzene in the air can attach to rain or snow and be carried back down to the ground.
- It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- Benzene does not build up in plants or animals.

How might I be exposed to benzene?

- Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.
- Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.
- People working in industries that make or use benzene may be exposed to the highest levels of it.
- A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

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

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

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

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

How likely is benzene to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

Glossary

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

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

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

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

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

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

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ETHYLBENZENE

CAS # 100-41-4

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

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

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

What is ethylbenzene?

(Pronounced ĕth′ əl bĕn′ zēn′)

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

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

What happens to ethylbenzene when it enters the environment?

- ☐ Ethylbenzene moves easily into the air from water and soil.
- ☐ It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- ☐ Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.
- ☐ In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- ☐ In soil, it is broken down by soil bacteria.

How might I be exposed to ethylbenzene?

- ☐ Breathing air containing ethylbenzene, particularly in areas near factories or highways.
- ☐ Drinking contaminated tap water.
- ☐ Working in an industry where ethylbenzene is used or made.
- ☐ Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

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

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

How likely is ethylbenzene to cause cancer?

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

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

How can ethylbenzene affect children?

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

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

How can families reduce the risk of exposure to ethylbenzene?

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

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

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

References

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

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

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POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

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

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

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

What are polycyclic aromatic hydrocarbons?

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

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

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

What happens to PAHs when they enter the environment?

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

How might I be exposed to PAHs?

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

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

How can PAHs affect my health?

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

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

How likely are PAHs to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

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

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

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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

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Agency for Toxic Substances and Disease Registry

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

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

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

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

What is xylene?

(Pronounced zī′lēn)

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

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

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

What happens to xylene when it enters the environment?

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

How might I be exposed to xylene?

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

How can xylene affect my health?

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

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

How likely is xylene to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

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

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

Glossary

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

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

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

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

ATTACHMENT B

WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

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

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

ATTACHMENT C

REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: ________________ Project Name/Number: ________________________________

Report Date: ________________ Project Manager Name: ________________________________

Summary of any violations of procedures occurring that week:

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

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

Comments:

Name: ____________________________ Company: ________________________________

Signature: ____________________________ Title: ________________________________

INCIDENT REPORT FORM

Date of Report: ______________________________

Injured: ______________________________

Employer: ______________________________

Site: ____________________ Site Location: ____________________

Report Prepared By: ____________________ ____________________
Signature Title

ACCIDENT/INCIDENT CATEGORY (check all that applies)

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

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

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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: ____

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CLASSIFICATION OF INJURY:

__ Abrasions

__ Bites

__ Blisters

__ Bruises

__ Chemical Burns

__ Cold Exposure

__ Concussion

__ Lacerations

_____ Dislocations

_____ Faint/Dizziness

_____ Fractures

_____ Frostbite

_____ Heat Burns

_____ Heat Exhaustion

_____ Heat Stroke

____ Punctures

____ Radiation Burns

____ Respiratory Allergy

____ Sprains

____ Toxic Resp. Exposure

____ Toxic Ingestion

____ Dermal Allergy

Part of Body Affected: ____

Degree of Disability: ____

Date Medical Care was Received: ____

Where Medical Care was Received: ____

Address (if off-site): ____

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

PROPERTY DAMAGE:

Description of Damage: ____

Cost of Damage: $ ____________________________________

ACCIDENT/INCIDENT LOCATION: ________________________________

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

Was weather a factor?: ____

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

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

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

Modifications:

Was injured using required equipment?:

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

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

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature Title

Signature Title

Signature Title

ACCIDENT/INCIDENT FOLLOW-UP: Date:

Outcome of accident/incident:

Physician's recommendations:

Date injured returned to work:

Follow-up performed by:

Signature Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

ATTACHMENT D

EMERGENCY HAND SIGNALS

EMERGENCY SIGNALS

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

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

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATH!

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