AKRF
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NYS DEC REGION 2
RECEIVED

March 27, 2009

Mr. Bryan Wong
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 2
47-40 21st Street
Long Island City, NY 11101-5407

Re: Revised Supplemental Remedial Investigation Work Plan
2350 Fifth Avenue; New York, NY
Site #231004

Dear Mr. Wong:

In accordance with the November 2008 New York State Department of Environmental Conservation (NYSDEC) response to the June 2008 Draft Remedial Investigation Report and NYSDEC comments to the Supplemental Remedial Investigation Work Plan (SRIWP) submitted during a site meeting and subsequent emails in February 2009, AKRF, Inc. (AKRF) has prepared this Revised SRIWP for the site referenced above. The supplemental investigation comprises the following tasks which will be carried out to further delineate areas of contamination and local groundwater flow:

- Installation and sampling of eleven additional off-site permanent soil vapor wells on immediately adjacent blocks;
- Installation and sampling of three off-site temporary sub-slab vapor monitoring points;
- Installation and sampling of two additional off-site monitoring wells; and
- Sampling of existing soil vapor and groundwater monitoring wells.

Please contact Marc at (914) 922-2356 or Kate at (646) 388-9525 with any comments or questions.

Sincerely,
AKRF, Inc.

Marc S. Godick, LEP
Senior Vice President

Kathleen Brunner
Technical Director

M:\AKRF Project Files\08010 - 2350 Fifth Ave (AKA 141st St & Fifth Avenue)\RI\Supplemental RI - 2009\RIWP\Revised supplemental RIWP Mar 2009.doc

Enclosure: Revised Supplemental Remedial Investigation Work Plan

cc: Jane O'Connell / NYSDEC Region 2
Dawn Hettrick, Steven Karpinski / NYS DOH
Joseph Karten, 2350 Fifth Avenue Corp.

AKRF

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

Submitted to:

2350 Fifth Avenue Corporation
309 East 94th Street, Ground Floor
New York, NY 10128

REVISED SUPPLEMENTAL
REMEDIAL INVESTIGATION
WORK PLAN
[illegible]
2350 Fifth Avenue
New York, NY [illegible]
[illegible]
March 2004

2350 Fifth Avenue

Site #2-31-004

NEW YORK, NEW YORK

Revised Supplemental Remedial Investigation Work Plan

AKRF Project Number: 08010

NYS DEC REGION 2
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Prepared for:

2350 Fifth Avenue Corporation
309 East 94th Street, Ground. Floor
New York, NY 10128

Prepared by:

AKRF, Inc.
440 Park Avenue South
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212-696-0670

MARCH 2009

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1.0 SUMMARY

AKRF, Inc. (AKRF) has been involved with continuing remedial activities at 2350 Fifth Avenue, located in Harlem, New York, (the Site). Following the 2007-2008 remedial investigation, a Draft Remedial Investigation Report (RIR) was submitted in March 2008, summarizing all previous site investigations and site background and history. The Draft RIR was subsequently revised in June 2008. In accordance with the New York State Department of Environmental Conservation (NYSDEC) response to the Draft RIR, dated November 14, 2008 and NYSDEC comments to the Supplemental Remedial Investigation Work Plan (SRIWP) submitted during a site meeting and subsequent emails in February 2009, AKRF has prepared this Revised SRIWP. The supplemental investigation comprises the following tasks which will be carried out to further delineate areas of contamination and local groundwater flow:

- Installation and sampling of eleven additional off-site permanent soil vapor wells on immediately adjacent blocks;
- Installation and sampling of three off-site temporary sub-slab vapor monitoring points;
- Installation and sampling of two additional off-site monitoring wells; and
- Sampling of existing soil vapor and groundwater monitoring wells.

The general procedures for boring and well installation, sampling, soil and groundwater management, and health and safety will be in accordance with the Quality Assurance Project Plan (QAPP) and site-specific Health and Safety Plan (HASP), attached as Appendices A and B, respectively.

2.0 ADDITIONAL OFF-SITE SOIL VAPOR WELL INSTALLATION AND SAMPLING

Additional off-site soil vapor wells will be installed and sampled to further delineate the soil vapor contamination off-site. A soil vapor sampling event, inclusive of existing on- and off-site soil vapor wells, will be conducted after successful installation of the new wells. Sub-slab vapor sampling will also be performed beneath the north-adjacent building. Complete details regarding soil vapor well installation and sampling are included in the QAPP (Appendix A).

2.1 Additional Permanent Soil Vapor Monitoring Points

Between 2007 and 2008, 12 permanent soil vapor wells were installed and sampled as part of the site-wide remedial investigation. Laboratory analytical results were used to approximate the PCE and associated breakdown product plume. In response to the findings of the remedial investigation presented in the Draft RIR, NYSDEC requested the installation of 11 additional off-site soil vapor wells to further delineate the soil vapor contamination plume. The vapor monitoring points (SG-21 to SG-31) are to be installed on the sidewalks of the immediately adjacent blocks, at the approximate locations shown on Figure 1. Exact locations may be offset due to field conditions such as property accessibility and obstructions (e.g., utilities, trees, etc.). Each soil vapor well will be constructed by retrofitting an approximately 4-foot deep soil boring with a six-inch internally perforated sampling point connected to a Teflon sampling tube extending to grade. A list and description of the existing and proposed soil vapor wells are provided as Table 1.

2.2 Sub-Slab Vapor Monitoring Points

As requested by NYSDEC, three sub-slab vapor samples will be collected off-site from the north-adjacent property. The three samples (SG-32 to SG-34) will be targeted to be evenly distributed throughout the southeastern quadrant of this property, as shown on Figure 1. The exact locations of these samples will be determined in the field based on accessibility and approval by the site superintendent. Each temporary sub-slab vapor sampling point will be constructed with a six-inch long internally perforated stainless steel sampling point connected to Teflon-lined sampling tubing extending to grade. The sample will be collected at an interval of 6 to 18 inches below the bottom of the concrete slab.

2.3 Soil Vapor Sampling

Following the installation of the additional off-site soil vapor wells, soil vapor samples will be collected from each of the soil vapor monitoring points. Soil vapor samples will be collected from the permanent monitoring points using a laboratory supplied 1- or 5-liter SUMMA canister with an applied vacuum. Samples will be collected using laboratory supplied regulators calibrated for a 10-minute sampling period for outdoor well locations and calibrated for an 8-hour sampling period for indoor well locations. All samples will then be analyzed for volatile organic compounds (VOCs) by Environmental Protection Agency (EPA) Method TO-15 plus tentatively identified compounds (TICs). In addition to the soil vapor samples, quality assurance/quality control (QA/QC) samples, comprising one blind duplicate sample and one ambient air sample, will also be submitted for laboratory analysis. Soil vapor samples will be collected from the temporary sub-slab vapor monitoring points using similar methodology; however, no additional QA/QC samples will be collected. Sample duration for the three sub-slab vapor samples on the north-adjacent property may be shorter than 8 hours depending on building access and property owner consent.

3.0 ADDITIONAL OFF-SITE GROUNDWATER MONITORING WELL INSTALLATION AND SAMPLING

Two additional off-site groundwater monitoring wells will be installed to further evaluate the groundwater contamination and groundwater flow in the vicinity. A groundwater sampling event, inclusive of existing on- and off-site monitoring wells, will be conducted after successful installation of the new well. Details regarding monitoring well installation, development, sampling and soil sampling are provided in the QAPP (Appendix A).

3.1 Additional Shallow Monitoring Wells

Monitoring wells M-14s and M-14d will be installed at the approximate locations depicted on Figure 2, pending access to the off-site property. This monitoring well cluster will comprise a shallow well screened across the water table above the low permeability organic layer that is known to exist in the saturated zone, and a deeper well screened below the low permeability organic layer.

While advancing the deeper soil boring, soil samples will be collected continuously for field screening purposes. Two discrete soil samples will be collected for laboratory analysis of VOCs by EPA Method 8260. If field screening reveals no particular signs of contamination, samples will be taken from the 1-foot range directly above the groundwater interface and the 1-foot span directly above the organic clay layer. If evidence of contamination is noted, a sample will be taken from a 1-foot range that comprises the most contaminated region. The wells will each consist of a 2-inch diameter PVC pipe with a 10-foot section of 20-slot well screen, and a 1-foot sediment trap at the base. The well screen on the shallow well (M-14s) is to be situated such that the screen spans the water table. The well screen on the deeper well (M-14d) is to be situated with the top of the well screen one foot below the bottom of the clay layer; the clay layer at this location is estimated to extent to a depth of about 20 feet below grade.

Immediately following installation, the monitoring wells will be developed to remove any sediment that may have entered the well during or immediately after installation. A list and description of the existing and proposed groundwater monitoring wells are provided as Table 2.

3.2 Monitoring Well Sampling

The newly installed monitoring wells will not be sampled for a minimum of seven days following development. A full round of groundwater samples will then be collected from all on- and off-site wells using USEPA low-flow sampling guidelines. In accordance with the NYSDEC response to the Draft RIR, if light non-aqueous phase liquid (LNAPL) is encountered in monitoring well M-12S, or any other monitoring well, a sample of the LNAPL will be collected for fingerprint analysis. All groundwater samples will be analyzed for VOCs by EPA Method 8260. In addition to the field samples, QA/QC samples comprising an equipment blank, matrix spike/matrix spike duplicate (MS/MSD), blind duplicate and trip blank samples will be collected and analyzed for VOCs.

4.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

All investigation-derived waste (IDW) will be containerized in United States Department of Transportation (DOT)-approved 55-gallon drums. The drums will be sealed at the end of each work day and labeled with the date, the well or boring number(s), the type of waste (i.e., drill cuttings, development water or purge water) and the name of an AKRF point-of-contact. If required for disposal, samples will be collected from the drums of IDW. All drums will be labeled "pending analysis" until laboratory data is available. All IDW will be disposed of or treated according to applicable local, state and federal regulations.

5.0 SURVEYING

At the completion of sampling activities, the newly-installed groundwater monitoring wells will be surveyed by a New York State-licensed surveyor. Three elevation measurements will be taken at the well: the elevation of the ground beside the well; the elevation on the rim of the gate box or protective casing; and the elevation of the top of PVC casing.

6.0 REPORTING

Findings from this supplemental remedial investigation will be incorporated into a revision of the June 2008 Remedial Investigation Report. The Revised RIR will include a summary of the findings of the all previous remedial investigations. As with previous versions of the RIR, the Revised RIR will document field activities; present field and laboratory data; discuss groundwater, soil and soil vapor quality, evaluate exposure and risks to human health; and discuss conclusions and recommendations drawn from the results of the investigation. Attachments to the report will include summary tables of the laboratory data, complete laboratory analytical reports, latitude and longitude coordinates for each sampling location, and a qualitative human health exposure assessment.

7.0 SCHEDULE

Implementation of the SRIWP will begin upon NYSDEC approval. Access agreements and sidewalk permits must be coordinated prior to commencement of any off-site field work. The findings of the investigation will be incorporated into a Revised Draft RIR, which will be presented to the NYSDEC before preparation of a feasibility study for the final remedial measures.

TABLES

Table 1
2350 Fifth Avenue
Harlem, NY
Soil Vapor Sampling Details

Soil Vapor Point	Location	Analytes	Existing/Proposed
SG-3	Off-site, across West 142nd Street	VOCs and TICs	Existing
SG-4	Off-site, across West 142nd Street	VOCs and TICs	Existing
SG-5	Off-site, across West 142nd Street	VOCs and TICs	Existing
SG-6	On-site, in storage building	VOCs and TICs	Existing
SG-7	On-site, on 142nd Street sidewalk	VOCs and TICs	Existing
SG-8	On-site, in storage building	VOCs and TICs	Existing
SG-9	On-site, in storage building	VOCs and TICs	Existing
SG-10	On-site, in storage building	VOCs and TICs	Existing
SG-11	On-site, in storage building	VOCs and TICs	Existing
SG-12	On-site, in storage building	VOCs and TICs	Existing
SG-13	On-site, in south loading dock	VOCs and TICs	Existing
SG-14	On-site, in south loading dock	VOCs and TICs	Existing
SG-15	Off-site, across West 142nd Street	VOCs and TICs	Proposed
SG-16	Off-site, across Fifth Avenue	VOCs and TICs	Proposed
SG-17	Off-site, across Fifth Avenue	VOCs and TICs	Proposed
SG-18	Off-site, across Fifth Avenue	VOCs and TICs	Proposed
SG-19	Off-site, across West 141st Street	VOCs and TICs	Proposed
SG-20	Off-site, across West 141st Street	VOCs and TICs	Proposed
SG-21	Off-site, across West 141st Street	VOCs and TICs	Proposed
SG-22	Off-site, across West 141st Street	VOCs and TICs	Proposed
SG-23	Off-site, across Chisum Place	VOCs and TICs	Proposed
SG-24	Off-site, across Chisum Place	VOCs and TICs	Proposed
SG-25	Off-site, across Chisum Place	VOCs and TICs	Proposed
SG-32	Off-site, across West 142nd Street	VOCs and TICs	Proposed
SG-33	Off-site, across West 142nd Street	VOCs and TICs	Proposed
SG-34	Off-site, across West 142nd Street	VOCs and TICs	Proposed
Ambient Air	On-site, in an exterior area	VOCs and TICs	NA
Blind Duplicate	On-site, simultaneously with another on-site sample	VOCs and TICs	NA

NOTES:

1. VOC - Volatile Organic Compounds
2. TICs - Tentatively Identified Compounds

Table 2
2350 Fifth Avenue
Harlem, NY
Groundwater Sampling Details

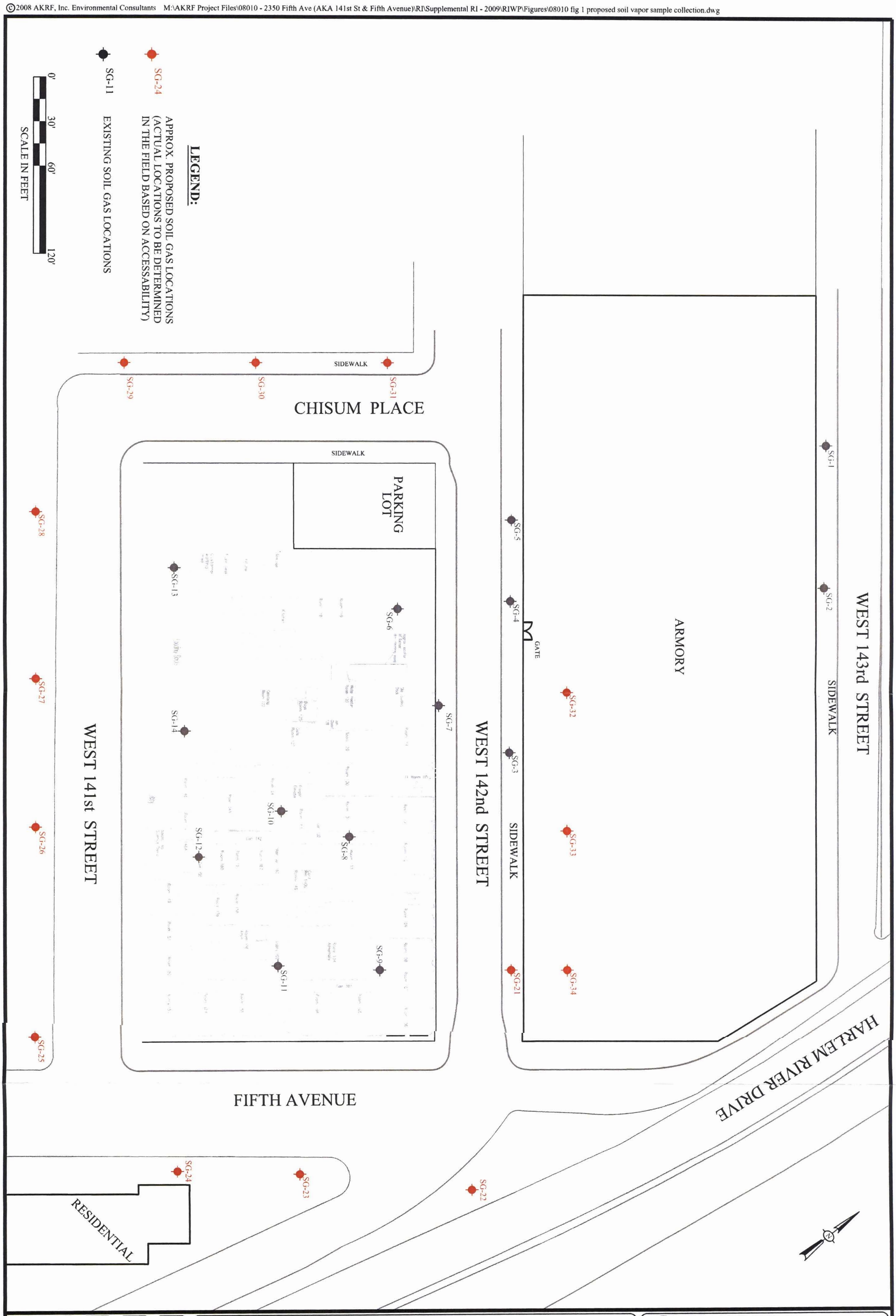
Groundwater Monitoring Well	Location	Analytes	Existing/ Proposed
M-1	On-site, in northwest open-air parking lot	VOCs	Existing
M-2	On-site, in storage building	VOCs	Existing
M-3	On-site, in north loading dock	VOCs	Existing
M-4	On-site, on West 141st Street sidewalk	VOCs	Existing
M-4D	On-site, on West 141st Street sidewalk	VOCs	Existing
M-5	On-site, on Fifth Avenue sidewalk	VOCs	Existing
M-5D	On-site, on Fifth Avenue sidewalk	VOCs	Existing
M-6	On-site, on Fifth Avenue sidewalk	VOCs	Existing
M-6D	On-site, on Fifth Avenue sidewalk	VOCs	Existing
M-7	Off-site, across West 142nd Street	VOCs	Existing
M-8	Off-site, across West 142nd Street	VOCs	Existing
M-9S	Off-site, on West 143rd Street	VOCs	Existing
M-9D	Off-site, on West 143rd Street	VOCs	Existing
M-10S	Off-site, on West 143rd Street	VOCs	Existing
M-10D	Off-site, on West 143rd Street	VOCs	Existing
M-11S	On-site, on West 142nd Street sidewalk	VOCs	Existing
M-11D	On-site, on West 142nd Street sidewalk	VOCs	Existing
M-12S	On-site, on West 142nd Street sidewalk	VOCs	Existing
M-12D	On-site, on West 142nd Street sidewalk	VOCs	Existing
M-13S	Off-site, across Chisum Place	VOCs	Existing
M-13D	Off-site, across Chisum Place	VOCs	Existing
M-14S	Off-site, across 142nd Street	VOCs	Proposed
M-14D	Off-site, across 142nd Street	VOCs	Proposed
Equipment Blank	NA	VOCs	NA
Matrix Spike/Matrix Spike Duplicate	On-site, simultaneously with another on-site sample	VOCs	NA
Duplicate	On-site, simultaneously with another on-site sample	VOCs	NA
Blind Duplicate	On-site, simultaneously with another on-site sample	VOCs	NA
Trip Blank	Laboratory supplied	VOCSs	NA

NOTES:

1. NA - Not applicable
2. VOC - Volatile Organic Compounds

FIGURES

©2008 AKRF, Inc. Environmental Consultants M:\AKRF Project Files\08010 - 2350 Fifth Ave (AKA 141st St & Fifth Avenue)\RI\Supplemental RI - 2009\RIWP\Figures\08010 fig 1 proposed soil vapor sample collection.dwg



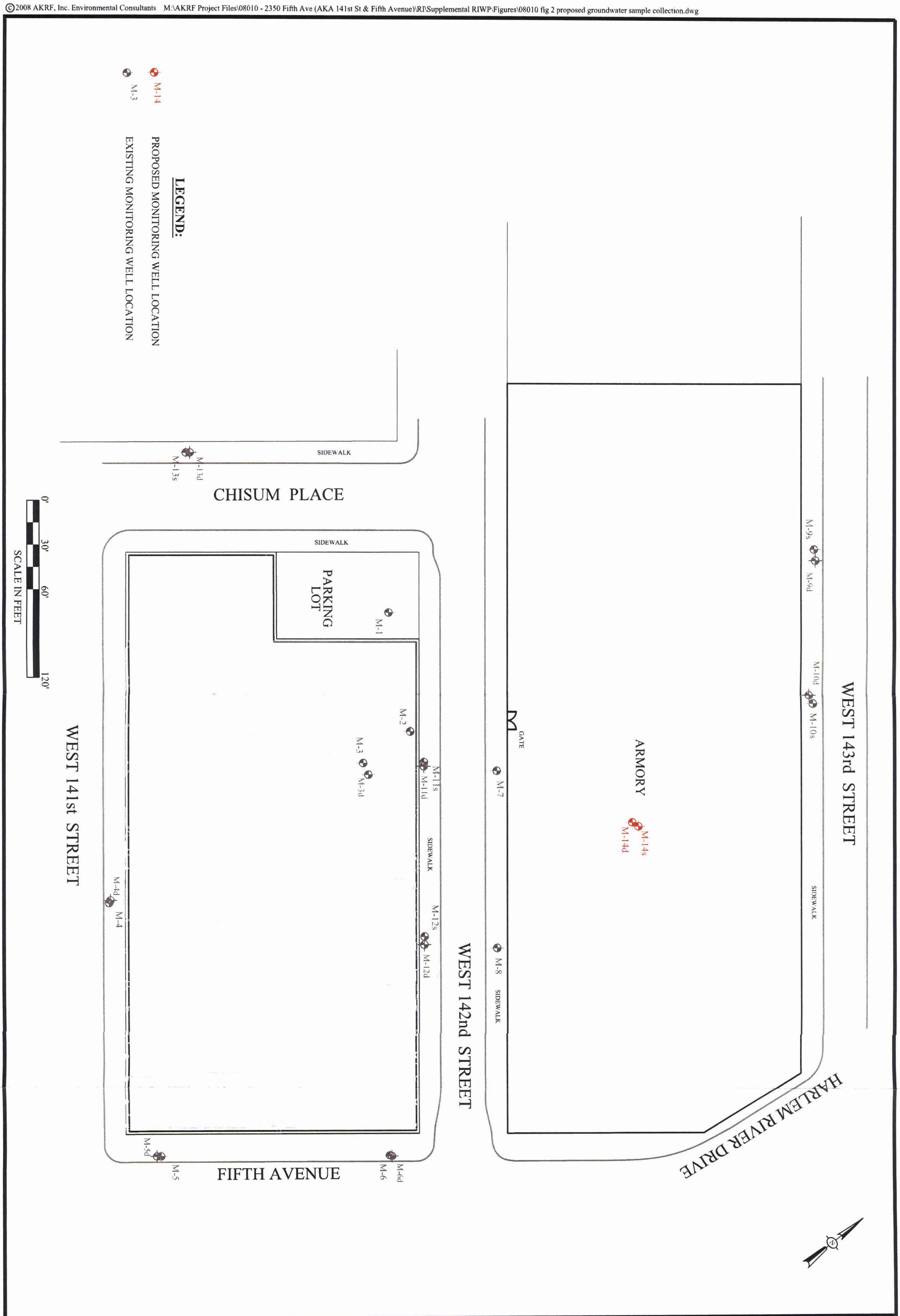
DATE	PROJECT NO	SCALE	FIGURE
3.10.09	08010	as shown	1

2350 FIFTH AVENUE
NEW YORK, NEW YORK

PROPOSED SOIL VAPOR SAMPLE COLLECTION

AKRF
Environmental Consultants
440 Park Avenue South, New York, NY 10016

©2008 AKRF, Inc. Environmental Consultants M:\AKRF Project Files\08010 - 2350 Fifth Ave (AKA 141st St & Fifth Avenue)\RI\Supplemental RIWP\Figures\08010 fig 2 proposed groundwater sample collection.dwg



2350 FIFTH AVENUE
NEW YORK, NEW YORK

PROPOSED GROUNDWATER SAMPLE COLLECTION

AKRF
Environmental Consultants
440 Park Avenue South, New York, NY 10016

DATE
2.12.09

PROJECT NO.
08010

SCALE
as shown

FIGURE
2

APPENDIX A
QUALITY ASSURANCE PROJECT PLAN

2350 Fifth Avenue

Site #2-31-004

MANHATTAN, NEW YORK

Quality Assurance Project Plan

AKRF Project Number: 08010

Prepared for:

2350 Fifth Avenue Corporation
309 East 94th Street, Ground Floor
New York, NY 10128

Prepared by:

AKRF

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

MARCH 2009

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(In Text)

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of the Revised Supplemental Remedial Investigation Work Plan (SRIWP) at the 2350 Fifth Avenue site at West 141st Street and Fifth Avenue in the Borough of Manhattan, New York, 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 SRIWP. Adherence to the QAPP will ensure that defensible data will be obtained during the 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, the New York State Department of Environmental Conservation (NYSDEC), and 2350 Fifth Avenue Corporation to ensure a smooth flow of information between involved parties. Marc S. Godick, LEP, will serve as the project director for the SRIWP. Mr. Godick'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 SRIWP. The project manager will prepare reports and participate in meetings with 2350 Fifth Avenue Corporation and/or the NYSDEC. Kathleen Brunner will serve as the project manager for the SRIWP. Ms. Brunner'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 and will ensure adherence to the work plan and HASP. He/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 will be a qualified, responsible person, able to act professionally and promptly during soil disturbing activities.

2.4 Project Quality Assurance/Quality Control Officer

The Quality Assurance/Quality Control (QA/QC) Officer will be responsible for adherence to the QAPP. The QA/QC Officer will review the procedures with all personnel prior to commencing any fieldwork and will conduct periodic site visits to assess implementation of the procedures. The QA/QC officer will also be responsible for reviewing a Data Usability Summary Report (DUSR) for soil, soil gas and groundwater analytical results, if required, as described in Section 5.0 of this QAPP. Marcus Simons will serve as the QA/QC officer for the SRIWP. Mr. Simons's resume is included in Attachment A.

2.5 Project Quality Assurance/Quality Control Reviewer

The QA/QC Reviewer will be responsible for preparing a Data Usability Summary Report (DUSR) for laboratory analytical results, if required, as described in Section 5.0 of this QAPP. The QA/QC Reviewer will work under the direction of the Project Manager and QA/QC Officer.

2.6 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 or laboratories for the SRIWP.

3.0 STANDARD OPERATING PROCEDURES

The following sections describe the standard operating procedures (SOPs) for the investigative activities included in the SRIWP. 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.

3.1 Soil Borings

Soil boring procedures using a direct-push probe (DPP) and a hollow stem auger (HSA) rig are described below.

3.1.1 Soil Boring Installation using Direct Push Probe (DPP)

Soil borings will be completed according to the following procedure:

1. For off-site borings (including sidewalk borings) advance a hand auger to a depth of 3 feet below grade to clear subsurface utilities.
2. Continue to advance borings using a DPP.
3. Use the DPP rig or a concrete drill to core through any existing asphalt or concrete surface.
4. Drive four-foot long, two-inch diameter, stainless steel macrocore piston rod sampler fitted with an acetate liner through subsurface.
5. Collect soil samples using macrocore sampler and as described in Section 4.1 of this QAPP.
6. Grout borehole with bentonite-cement slurry upon completion.
7. Decontaminate all non-dedicated sampling equipment between samples (macrocores), and prior to and following each soil boring location (probe rods) as described in Section 3.4 of this QAPP.
8. Containerize and handle all drill cuttings, plastic samples sleeves, and decontamination water as described in Section 3.5 of this QAPP.

3.1.2 Soil Boring Installation using Hollow-Stem Auger (HSA)

Soil borings will be completed according to the following procedure:

1. For off-site boring (including sidewalk borings) advance a hand auger to a depth of 3 feet below grade to clear subsurface utilities.
2. Advance borings using a HSA rotary rig with 6.25-inch outside diameter augers.
3. Use the HSA rig to core through any existing asphalt or concrete surface.
4. Drive stainless steel, 24-inch split-spoon sampler through subsurface ahead of auger.
5. Collect soil samples using split-spoon samplers and as described in Section 4.1 of this QAPP.
6. If the borings are not to be converted to monitoring wells, grout borehole with bentonite-cement slurry upon completion.
7. Decontaminate all non-dedicated sampling equipment between samples (split spoons), and prior to and following each soil boring location (augers) as described in Section 3.4 of this QAPP.
8. Containerize and handle drill cuttings and decontamination water as described in Section 3.5 of this QAPP.

3.2 Monitoring Well Installation and Development

Groundwater monitoring wells will be installed and developed according to the following procedure:

1. Advance a hand auger to a depth of 3 feet below grade to clear subsurface utilities.
2. Use the HSA rig to core through any existing asphalt or concrete surface and advance borings with 6.25-inch outside diameter augers in accordance with Section 3.1.2.
3. Measure the depth to water in the open hole using a Solinst® Water Table Meter – Model 101 or equivalent.
4. Place PVC riser with a five-foot length of PVC 0.02-slotted screen at the bottom of the borehole. In determining the amount of screen that will be located beneath the water table, the elevation of the seasonal water table will be considered. The well screen will be situated to provide sufficient water in the well for sampling at all times and to limit sample collection close to the base of the well.
5. Install No. 1 sand filter pack around the well screen to a depth of one to two feet above the top of the screen.
6. Install a bentonite seal to a depth of one to two feet above the filter pack.
7. Backfill the remainder of the annular space using a bentonite-cement grout.
8. Complete the well with a locking cap flush-with-grade curb box set in concrete. Provide a concrete apron around the curb box to direct run-off away from the well.
9. Decontaminate the augers prior to and following installation of each well as described in Section 3.5 of this QAPP.

10. Document well installation data (location, depth, construction details, water level measurements) in the field logbook or on field data sheets
11. Following well installation, the ten new wells will be developed according to the following procedure:
12. Measure the depth to water using an oil/water interface probe and the total depth of the well using a weighted tape. Use these measurements to calculate the length of the water column. Calculate the volume of water in the well using 0.163 volumes per foot of water column (gallons) as the conversion factors for a 2-inch diameter well.
13. For the first five minutes of well development, develop the well using a submersible pump and re-circulate the water back into the well to create maximum agitation. This method is intended to remove fines from the sand pack, the adjacent formation and from the well.
14. After the first five minutes of well development, develop the well using a submersible pump and discharge the water to five-gallon buckets. Transfer water from the buckets to 55-gallon drums designated for well development water.
15. During development, collect periodic samples and analyze for turbidity and water quality indicators (pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity) with measurements collected approximately every five minutes.
16. Continue developing the well until turbidity is less than 50 nephelometric turbidity units (NTUs) for three successive readings and until water quality indicators have stabilized to within 10% for pH, temperature and specific conductivity for three successive readings, or until three well volumes have been purged from the well.
17. Document the volume of water removed and any other observations made during well development in the field logbook or on field data sheets.
18. Decontaminate all equipment prior to and following development at each well location as described in Section 3.5 of this QAPP.
19. Containerize and handle all well development water, decontamination, and purge water as described in the Section 3.6 of this QAPP.

Monitoring well sampling procedures are described in Section 4.2 of this QAPP.

3.3 Temporary Sub-Slab Vapor Probe Installation and Sampling

The temporary sub-slab vapor sampling probes will be installed using the following procedure:

1. Core or cut and remove a patch of the concrete slab at each location.
2. Insert new, clean 3/16-inch inside diameter Teflon-lined tubing to the sampling probe.
3. Drive the soil gas sampler and attached tubing to a depth of 18 inches below the bottom of the concrete slab.
4. Retract the soil gas sampler approximately one foot to create a void between the interval of 6 and 18 inches below the concrete slab.
5. Sand will be placed in the annular space around the soil gas sampler to a depth of 6 inches below the concrete slab. Wetted bentonite will be used to fill any remaining annular space and create a seal preventing above grade air from altering sub-surface gas conditions.

6. Install a 2-foot by 2-foot 6-mil plastic shroud over sampling point, seal to the concrete slab using duct tape along the perimeter, and pull the Teflon soil gas sampling tubing through the shroud to allow for sampling collection.
7. Pierce a second hole in the plastic shroud, insert one end of new tubing through the hole, and connect the other end of the tubing to the helium tank to allow introduction of the helium tracer.
8. Install new flexible hose to a peristaltic pump and connect the Teflon sampling tubing to the hose. Connect the other end (discharge end) of the flexible tubing to a 1-liter Tedlar bag. Purge the soil gas sampler of approximately three sampler volumes by activating the pump to completely fill the Tedlar bag. The air withdrawal flow rate will be held to the extent practicable at less than 0.2 liters per minute to prevent infiltration of fugitive air from the ground surface via the annulus of the sampling probe.
9. Analyze the sample within Tedlar bag using a calibrated PID and a helium detector (Marks Model No. 9822 or equivalent.) If elevated concentrations of helium are detected, inspect surface seal, and if necessary, add hydrated bentonite to seal until helium concentrations are less than 10%.
10. After purging the soil gas sampler, disconnect the sample tubing from the peristaltic pump and connect it to the inlet of a labeled Summa canister fitted with a reflow regulator calibrated for sample collection over an 8-hour period of time. [Note: Sample duration for the three sub-slab vapor samples on the north-adjacent property may be shorter depending on building access and property owner consent.] Record the vacuum reading from the vacuum gauge on the canister at the beginning of the sampling period. Open the valve of the canister and record the time in the field book.
11. At the end of the sampling period and prior to the vacuum gauge returning to ambient pressure, close valve, remove flow-rate controllers and vacuum gauges, install caps on canisters, and record time.
12. The canister will be detached and placed in shipping containers for transportation to the laboratory. The container should prevent exposure to sunlight and should not contain ice.
13. During sampling, the ambient temperature and barometric pressure will be measured at a minimum before and after sample collection.
14. Grout borehole with bentonite and/or cement upon completion.
15. Decontaminate all equipment prior to and following each location as described in Section 3.5 of this QAPP.
16. Sample locations and measurements (sample flow rate, PID readings, temperature, barometric pressure) will be logged in a field book or on field data sheets.

3.4 Permanent Soil Gas Probe Installation

Soil gas probes will be installed using the procedures described below:

1. Core or cut and remove a patch of the concrete slab at each location.
2. Insert new, clean 3/16-inch inside diameter Teflon-lined tubing to the sampling probe.
3. Advance a 2-inch diameter hand auger to a depth of 3 feet below grade to clear subsurface utilities.
4. Place the soil gas sampler in the resulting soil boring and drive to 4 feet below grade.

5. Backfill the soil gas sampler with 6-inches of clean sand filter pack to prevent intake clogging.
6. Retract the drive casing to expose the three-inch perforated sampling port.
7. Remove sampler drive casing leaving the sampling tubing and tip in the boring.
8. Fill the remaining boring annulus with hydrated bentonite chips to grade to provide a seal to ensure the collection of a representative sample and prevent short-circuiting via the surface.
9. Install a 2-inch diameter flush-mount road box set within the concrete slab and let stabilize overnight.
10. Decontaminate all equipment prior to and following each location as described in Section 3.5 of this QAPP.

Soil gas sampling procedures are described in Section 4.3 of this QAPP.

3.5 Decontamination of Sampling Equipment

All sampling equipment 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 on plastic sheeting (or equivalent) that is bermed to prevent discharge to the ground and will be handled as described in Section 3.6.

3.6 Management of Investigation Derived Waste

All investigation-derived waste (IDW) will be containerized in Department of Transportation (DOT)-approved 55-gallon drums. The drums will be sealed at the end of each work day and labeled with the date, the well or boring number(s), the type of waste (i.e., drill cuttings; development water or purge water) and the name of an AKRF point-of-contact. Soil samples collected from soil borings and monitoring well installation activities will be used for waste characterization of soils, since such data would be biased towards areas which are expected to be most contaminated. Notwithstanding, additional waste characterization soil samples will be collected, if warranted. All drums will be labeled "pending analysis" until laboratory data is available. All IDW will be disposed of or treated according to applicable local, state and federal regulations.

4.0 SAMPLING AND LABORATORY PROCEDURES

4.1 Soil Sample Collection

Soil borings will be installed as described in Section 3.1 of this QAPP. Soil sampling will be conducted according to the following procedures:

- Characterize the sample according to the modified Burmister soil classification system and describing any evidence of contamination (e.g., oil-like or tar-like non-aqueous phase liquid, staining, sheens, odors; and screening for organic vapors using a photoionization detector (PID)).
- If advancing soil borings, collect an aliquot of soil from each sampling location and place in labeled sealable plastic bags. Place the plastic bags in a chilled cooler to await selection of samples for laboratory analysis. If performing endpoint sampling or characterization sampling, soil can be placed directly in laboratory-supplied sample jars.
- After selecting which samples will be analyzed in the laboratory, fill the required laboratory-supplied sample jars with the soil from the selected sampling location or labeled sealable plastic bags. Seal and label the sample jars as described in Section 4.6 of this QAPP and place in an ice-filled cooler.
- Decontaminate any soil sampling equipment between sample locations as described in Section 3.5 of this QAPP.
- Record boring number, sample depth and sample observations (evidence of contamination, PID readings, soil classification) in field log book and boring log data sheet, if applicable.

4.2 Monitoring Well Sampling

Monitoring wells will be installed and developed as described in Section 3.2 of this QAPP. Groundwater samples will be collected at least one week following well development. Low flow sampling techniques will be used, as described in U.S. EPA's Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers [EPA 542-S-02-001, May 2002]. Sampling will be conducted according to the following procedure:

- Prepare the sampling area by placing plastic sheeting over the well. Cut a hole in the sheeting to provide access to the well cover.
- Remove the locking cap and measure the vapor concentrations in the well with a PID.
- Measure the depth to water and total well depth, and check for the presence of light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) using an oil/water interface probe. Measure the thickness of NAPL, if any, and record in field book and well log. Collect a sample of NAPL using a disposable plastic weighted bailer or similar collection device. Groundwater samples will not be collected from wells containing measurable NAPL.
- Use the water level and total well depth measurements to calculate the length of the mid-point of the water column within the screened interval. For example, for a shallow well where the total depth is 15 feet, screened interval is 5 to 15 feet, and depth to water is 7 feet, the mid-point of the water column within the screened interval would be 11 feet. Similarly for a deep well where the total depth is 40 feet, screened interval is 30 to 40 feet, and depth to water is 15 feet, the mid-point of the water column within the screened interval would be 35 feet.

- Connect dedicated tubing to either a submersible or bladder pump and lower the pump such that the intake of the pump is set at the mid-point of the water column within the screened interval of the well. Connect the discharge end of the tubing to the flow-through cell of a Hydrolab Quanta multi-parameter (or equivalent) meter. Connect tubing to the output of the cell and place the discharge end of the tubing in a five-gallon bucket.
- Activate the pump at the lowest flow rate setting of the pump.
- Measure the depth to water within the well. The pump flow rate may be increased such that the water level measurements do not change by more than 0.3 feet as compared to the initial static reading. The well-purging rate should be adjusted so as to produce a smooth, constant (laminar) flow rate and so as not to produce excessive turbulence in the well. The expected targeted purge rate will be around 500 mil/minute and will be no greater than 3.8 liters/minute (1 gallon per minute).
- Transfer discharged water from the 5-gallon buckets to 55-gallons drums designated for well-purge water.
- During purging, collect periodic samples and analyze for water quality indicators (e.g., turbidity, pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity) with measurements collected approximately every five minutes.
- Continue purging the well until turbidity is less than 50 NTU and water quality indicators have stabilized to the extent practicable. The criteria for stabilization will be three successive readings for the following parameters and criteria:

Table 1
Stabilization Criteria

Parameter	**Stabilization Criteria**
PH	+/- 0.1 pH units
Specific Conductance	+/- 3% mS/cm
ORP/Eh	+/- 10mV
Turbidity	<50 NTU
Dissolved Oxygen	+/- 0.3 mg/l

Notes: mS/cm = millisievert per centimeter
mV = millivolts
NTU = nephthalometric turbidity units
mg/l = milligrams per liter

- If the water quality parameters do not stabilize and/or turbidity is greater than 50 NTU within two hours, purging may be discontinued. Efforts to stabilize the water quality for the well must be recorded in the field book, and samples may then be collected as described herein.
- After purging, disconnect the tubing to the inlet of the flow-through cell. Collect groundwater samples directly from the discharge end of the tubing and place into the required sample containers as described in Section 4.4 of this QAPP. Label the containers as described in Section 4.6 of this QAPP and place in a chilled cooler.
- Collect one final field sample and analyze for turbidity and water quality parameters (pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity).

- Once sampling is complete, remove the pump and tubing from the well. Disconnect the tubing and place it back in the well for reuse during the next sampling event. Dispose of the sample filter in a 55-gallon drum designated for disposable sampling materials and PPE.
- Decontaminate the pump, oil/water interface probe, flow-through cell, and plastic filter chamber as described in Section 3.5 of this QAPP.
- Record all measurements (depth to water, depth to NAPL, water quality parameters, turbidity), calculations (well volume) and observations in the project logbook and field data sheet, if applicable.

4.3 Soil Gas Sampling (Permanent Soil Gas Probes)

Sampling of temporary sub-slab vapor probes is detailed in Section 3.3. Sampling soil gas from the permanent soil gas probes will be conducted according to the following procedure:

1. Install a 2-foot by 2-foot 6-mil plastic shroud over sampling point, seal to the concrete slab using duct tape along the perimeter, and pull the Teflon-lined soil gas sampling tubing through the shroud to allow for sampling collection.
2. Pierce a second hole in the plastic shroud, insert one end of new tubing through the hole, and connect the other end of the tubing to the helium tank to allow introduction of the helium tracer.
3. Install new flexible hose to a peristaltic pump and connect the Teflon sampling tubing to the hose. Connect the other end (discharge end) of the flexible tubing to a 1-liter Tedlar bag. Purge the soil gas sampler of approximately three sampler volumes by activating the pump to completely fill the Tedlar bag. The purge rate should be 0.2 liters per minute or less.
4. Analyze the sample within Tedlar bag using a calibrated PID and a helium detector (Marks Model No. 9822 or equivalent.) If elevated concentrations of helium are detected, inspect surface seal, and if necessary, add hydrated bentonite to seal until helium concentrations are less than 10%.
5. After purging the soil gas sampler, disconnect the sample tubing from the peristaltic pump and connect it to the inlet of a labeled Summa canister fitted with a laboratory-calibrated reflow regulator. Regulators for samples collected from outdoor well locations will be set for a 10-minute sampling period and regulators for samples from indoor well locations will be set for an 8-hour sampling period. Record the vacuum reading from the vacuum gauge on the canister at the beginning of the sampling period. Open the valve of the canister and record the time in the field book.
6. At the end of the sampling period and prior to the vacuum gauge returning to ambient pressure, close valve, remove flow-rate controllers and vacuum gauges, install caps on canisters, and record time.
7. Place canisters in shipping containers for transportation to laboratory.
8. Decontaminate all sampling equipment between sampling locations as described in Section 3.5 of this QAPP.

4.4 Laboratory Methods

A New York State certified laboratory will perform all analytical work. The laboratory will operate a QA/QC program that will consist of proper laboratory practices (including the required chain-of-custody), an internal quality control program, and external quality control audits by New York State.

Table 2 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 Environmental Laboratory Approval Program (ELAP)-certified laboratory will be used for all chemical analyses in accordance with DER-10 2.1(b) and 2.1(f), i.e., Category B Deliverables and CLP ELAP Certification will be required for confirmatory (post remediation) samples and final delineation samples.

Table 2
Laboratory Analytical Methods for Analysis Groups

ANALYSIS GROUP	MATRIX	PARAMETER	EPA METHOD	SAMPLE CONTAINERS	PRESERVATION	HOLDING TIMES
SOIL ANALYSIS PARAMETERS	solid	TCL VOCs	8260	2 oz. clear glass Septum	4°C	14 days
GROUNDWATER ANALYSIS PARAMETERS	liquid/sludge	TCL VOCs	8260	(2) 40 ml clear glass vial	HCl, 4°C	14 days
SOIL GAS ANALYSIS PARAMETERS	air	VOCs	TO-15	Summa Canister	--	30 days

Notes: VOCs = volatile organic compounds
HCL = Hydrochloric Acid

4.5 Quality Control Sampling

In addition to the laboratory analysis of the investigative and remedial soil, groundwater, and soil gas samples, additional analysis will be included for quality control measures, as required by the Category B sampling techniques. These samples may include equipment rinsate blanks, trip blanks, matrix spike/matrix spike duplicates (MS/MSD) and of duplicate/blind duplicate samples. Equipment blank, MS/MSD and duplicate samples will be analyzed for the same parameter set for which the samples will be analyzed. If the requested parameters include VOCs, a trip blank will be analyzed for volatile organic compounds only. Quality control samples will be collected at a frequency of one sample for every 20 field samples. Quality control sampling in accordance with the disposal facility requirements will be performed when collecting samples for disposal characterization.

4.6 Sample Handling

4.6.1 Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody documents and laboratory reports using an alpha-numeric code. Groundwater samples will be identified by the monitoring well number, soil boring samples will be identified by the soil boring number followed by the sample depth interval (in parenthesis), and soil gas samples will be identified by the soil gas number followed by the sample depth interval (in parenthesis). Waste characterization samples collected from 55-gallon drums will be identified by the drum number (e.g., D-1 or D-2) followed by a sample type designation (LQ for liquid and SD for solid).

The field duplicate samples will be labeled with a dummy sample location to ensure that they are submitted as blind samples to the laboratory. The dummy identification will consist of the sample type followed by a letter. For duplicate soil boring samples, the sample depth will be the actual sample depth interval. Trip blanks and field blanks will be identified with "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 5 to 7 feet at SB-3	SB-3 (5-7)
Groundwater sample collected from deep monitoring well M-5	M-5d
Soil gas sample collected from 5 to 6 feet at SG-2	SG-2 (5-6)
MS/MSD duplicate sample from SB-4	B-4-MS
Duplicate sample from 6 to 8 feet at SB-10	10SB (6-8)

4.6.2 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. Soil and groundwater samples will be shipped to the laboratory once to 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 sample in a sealable plastic bag, then wrapping each container in bubble wrap to prevent breakage, adding freezer packs and/or fresh ice in sealable plastic bags and the chain-of-custody 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 mailing tape and a chain-of-custody (COC) seal to ensure that the coolers remain sealed during delivery.

4.6.3 Sample Custody

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

4.7 Field Instrumentation

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

5.0 DATA REVIEW

The QA/QC Officer will conduct a review of all analytical data. If required, the QA/QC Reviewer will prepare a Data Usability Summary Report (DUSR) to assess the quality of the data and determine its usability. Data will be assessed according to the following procedure:

- Ensure the data package is complete as defined under the requirements for the NYSDEC Analytical Services Protocol (ASP) Category B deliverables and that all data were generated using established and agreed upon protocols.
- Check that all holding times were met.
- Check that all QC data (blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data) fall within the protocol required limits and specifications.
- Compare raw data with results provided in the data summary sheets and quality control verification forms.
- Check that correct data qualifiers were used.
- Evaluate the raw data and confirm the results provided in the data summary sheets and quality control verification forms.

Any QC exceedances will be specified in the DUSR, and the corresponding data package QC summary sheet identifying the exceedances will be attached. The DUSR will identify any data deficiencies, analytical protocol deviations and quality control problems and discuss their effect on the data. Recommendations for resampling and/or reanalysis will be made.

ATTACHMENT A

RESUMES OF PROJECT PERSONNEL

MARC S. GODICK, LEP

SENIOR VICE PRESIDENT

General Introduction

Marc S. Godick, a Senior Vice President of the firm, has over 18 years of experience in the environmental consulting industry. Mr. Godick's broad-based environmental experience includes expertise in remedial investigation, design and implementation of remedial measures, environmental/compliance assessment, litigation support, and storage tank management.

Remedial Investigation, Remediation, and Risk Assessment

Mr. Godick has comprehensive experience with completed projects throughout the Mid-Atlantic and New England regions. His specific experience includes development and implementation of multi-site strategies related to regulatory compliance including brownfields redevelopment, release reporting, remedial investigations, remediation, and risk assessment at bulk fuel storage/distribution, utility, chemical distribution, landfill, industrial, and commercial facilities.

Environmental/Compliance Assessment

Mr. Godick's experience in this area includes the completion and management of Phase I and Phase II environmental site assessment (ESA) and compliance audit projects throughout the United States and in Canada. He has provided management support to multi-site environmental assessment programs, with responsibilities including environmental liability analysis, compliance review, and waste management practices. His projects have included assessments of semiconductor reclamation facilities, food processing plants, and numerous other types of industrial and commercial facilities. Several of the projects were multiple-facility audits on a fast-track basis for venture capital firms, banks, and multinational corporations.

Litigation Support

Mr. Godick provided litigation support services for several remediation projects including insurance claims and other cost recovery actions. He provided expert testimony and developed detailed costing estimates and cost allocation models.

Storage Tank Management

Mr. Godick has managed several single and multi-facility underground and aboveground storage tank (UST/AST) replacement projects. His responsibilities included the management of design, preparation of specifications, contractor bidding, construction oversight, project budgets, and documentation. His compliance experience includes development and implementation of inspection, maintenance, record-keeping, and Spill Prevention Control Countermeasures (SPCC) programs.

BACKGROUND

Education

M.E., Engineering Science/Environmental Engineering, Pennsylvania State University, 1998

B.S., Chemical Engineering, Carnegie Mellon University, 1989

Licenses/Certifications

Licensed Environmental Professional (License # 396) – State of Connecticut – 2003

40 Hour HAZWOPER and Annual Refresher Training, 1990-2008

Supervisors of Hazardous Waste Operations (8 Hour), 1990

Professional Memberships

Member, Village of Larchmont/Town of Mamaroneck Coastal Zone Management Commission, 1997 - Present

Board of Directors, Westchester County Soil and Water Conservation District, 2005 - Present

Board of Directors, Sheldrake Environmental Center, Larchmont, New York, 2006 - Present

Member, NYSDEC Risk-Based Corrective Action (RBCA) Advisory Group for Petroleum-Impacted Sites, 1997

Community Leadership Alliance, Pace University School of Law, 2001

Seminars, Lectures & Publications

"Let Nature Do the Work – Onsite Stormwater Management," Westchester County Department of Parks, Recreation and Conservation, Fall 2003

"Water Pollution Control and Site Assessments and Audits," Environmental Health and Safety Issues Course, Building Owners and Managers Institute (BOMI), 1997-1999

"Hydrogeologic and Geological Aspects of Tank Closures and Remedial Action," Underground Storage Tanks Course, Government Institutes, Summer 1996, Fall 1997

"Soil and Groundwater Cleanup at What Cost? A Review of State-of-the-Art Technologies," Pennsylvania Chamber of Commerce, PennExpo, Fall 1995

Technical Review of "Soil Remediation Technologies" and "Ground Water Remediation Technologies" Chapters, Underground Storage Tank Manual, Thompson Publishing Group

Years of Experience

Year started in company: 2002

Year started in industry: 1990

RELEVANT EXPERIENCE

Flint Park Improvements, Village of Larchmont, NY

As a member of the joint Village of Larchmont/Town of Mamaroneck Coastal Zone Management Committee (CZMC), Mr. Godick was part of a committee involved in development of a master plan for improvements throughout Flint Park. The improvements including restoration of natural grass fields, development of an artificial turf field, and creation of an environmental restoration area along the park's waterfront. Mr. Godick reviewed available technical literature and provided recommendations to the Village Board regarding the use of artificial turf and limitations regarding potential environmental and health concerns.

Brownfield Opportunity Area (BOA) Grant Program Services for the Town of Babylon, Wyandanch, NY

AKRF was retained by the Town of Babylon to prepare a blight study, market study, NYS BOA Step 2 Nomination, an Urban Renewal Plan, and a Generic Environmental Impact Statement (GEIS) as part of a revitalization and redevelopment effort for downtown Wyandanch. Mr. Godick was responsible for overseeing the environmental data collection effort for the 226 brownfields identified in the 105-acre project area, and for identifying strategic sites for which site assessment funding should be sought. He also prepared the Hazardous Materials section of the Wyandanch Downtown Revitalization Plan (which incorporates the Nomination, Urban Renewal Plan, and GEIS), involving a summary of available environmental reports, a review of regulatory records, and limited street-level site inspections.

Alexander Street Urban Renewal Plan, Master Plan, Brownfield Opportunity Area Plan, Yonkers, NY

AKRF was retained by the City of Yonkers to prepare an Urban Renewal Plan, Master Plan, Brownfield Opportunity Area Plan, and a Generic Environmental Impact Statement (GEIS) for a 153 acre industrial area along Alexander Street on the Yonkers Waterfront. Mr. Godick is coordinating the preparation of BOA documents and was responsible for the Hazardous Materials sections of the GEIS and Urban Renewal Plan. Mr. Godick managed the environmental data collection effort for the entire study area which involved review and summary of existing environmental reports, a review of regulatory records, and field inspections. The collected information was used to prioritize individual parcels for funding and remediation. The Master Plan for the area calls for the development of a mixed-use neighborhood consisting of residential, neighborhood retail, and office space uses with substantial public open space, access to the Hudson River, and marina facilities.

Queens West Development Project, Avalon Bay Communities, Queens, NY

For over 20 years, AKRF has played a key role in advancing the Queens West development, which promises to transform an underused industrial waterfront property into one of largest and most vibrant mixed-use communities just across the East River from the United Nations. AKRF has prepared an Environmental Impact Statement (EIS) that examines issues pertaining to air quality, land use and community character, economic impacts, historic and archaeological resources, and infrastructure. Mr. Godick managed one of the largest remediation projects completed to date under the New York State Department of Environmental Conservation (NYSDEC) Brownfields Cleanup Program (BCP) that was contaminated by coal tar and petroleum. The remedy included the installation of a hydraulic barrier (sheet pile cut off wall), excavation of contaminated soil under a temporary structure to control odors during remediation, a vapor mitigation system below the buildings, and implementation of institution controls. The investigation, remediation design, and remedy implementation, and final sign-off (issuance of Certificate of Completion) were completed in two years. Total remediation costs were in excess of $13 million.

Williamsburg Waterfront Redevelopment, RD Management/L&M Equities/Toll Brothers, Brooklyn, NY

The project is one of the largest development projects in the Greenpoint/Williamsburg Rezoning Area, which includes the construction of nearly 1 million square feet of residential and retail space along the Williamsburg waterfront. The site had a variety of industrial uses, including a railyard, junk yard, and waste transfer station. As part of the City's rezoning, the site was assigned an E-designation for hazardous materials. Mr. Godick managed the preparation of the Phase I and II environmental site assessments, remedial action plan (RAP), and construction health and safety plan (CHASP). Mr. Godick obtained NYSDEC closure of an open spill associated with former underground storage tanks at the site. The NYCDEP-approved RAP and CHASP included provisions for reuse of the existing fill material, with the excess being disposed off-site, installation of a vapor barrier below the new buildings, installation of a site cap, and environmental monitoring during the construction activities. Mr. Godick is currently managing the environmental monitoring work that began in 2006. A Notice of Satisfaction has been issued by NYCDEP for the first phase of the development.

West 37th Street Redevelopment, Rockrose, New York, NY

The project is a redevelopment in the Hudson Yards Rezoning Area, which includes the construction of a 250,000 square foot residential/retail building in Manhattan. The site had several motor vehicle service operations, which resulted in a petroleum release to the underlying soil, bedrock, and groundwater. As part of the City's rezoning, the site was assigned an E-designation for hazardous materials. Mr. Godick managed the preparation of the Phase I and II environmental site assessments, remedial action plan (RAP), and construction health and safety plan (CHASP). Mr. Godick obtained approval for the RAP and CHASP by both the NYSDEC and NYCDEP. The RAP and CHASP included provisions for excavation of contaminated soil and bedrock, installation of waterproofing that will also serve as a vapor barrier for the new building, environmental monitoring during the construction activities, and post-development groundwater monitoring. Construction of the building is anticipated to be completed in 2009.

Landfill Closure & Compost Facility Application, White Plains, NY

Mr. Godick is currently managing the closure of a formal ash landfill, which is currently being utilized as a leaf and yard waste compost facility by the City of White Plains. The landfill closure requires additional assessment to define the extent of methane and solvent contamination, which will affect the design of the landfill cap and any additional remediation. Mr. Godick also managed the preparation of the compost facility permit application, which required modification to the facility's operations necessary to close the landfill and address other regulatory requirements.

Landfill Redevelopment – RD Management, Orangeburg, NY

Mr. Godick is currently managing the remediation of the former Orangeburg Pipe site under the Voluntary Cleanup Program. The site contains widespread fill material, which has fragments of Orangeburg pipe that is impregnated with asbestos and coal tar. The site is currently being redeveloped for retail use. The closure plan for the site provides for reuse of all fill material on-site. The fill management activities will include dust and sediment control measures and air monitoring to prevent airborne dust in accordance with a closure plan, stormwater pollution prevention plan (SWPPP), and construction health and safety plan (CHASP). In pervious areas, the site cap will consist of 2 feet of clean fill and a liner in larger areas. The site will be redeveloped for hotel and retail use.

Shaws Supermarket Redevelopment Project, New Fairfield, CT

Mr. Godick was the LEP of Record for the remediation of a shopping center site that was contaminated by on-site releases from former dry cleaning operations and off-site gasoline spills. A remediation plan was prepared and approved within one year to enable redevelopment work for a new supermarket and shopping center. The remediation was complicated by the use of groundwater as a potable source at the site and surrounding area. The remediation plan included the removal of contaminated soil and installation of a multi-well pump and treat system for the recovery of non-aqueous and dissolved phase contamination from two of the three aquifers. The soil removal activities and treatment system installation have been completed, and system operation, maintenance, and monitoring are ongoing.

National Grid – Halesite Manufactured Gas Plant Site, Town of Huntington, NY

Mr. Godick is managing the remedial design and engineering work associated with remediation of National Grid's former manufactured gas plant (MGP) located in the Town of Huntington. The site is situated in a sensitive location along the waterfront, surrounded by commercial and residential properties, and half the property where the remediation will be conducted is a steep slope. The remedy consists of soil removal, oxygen injection, and non-aqueous phase liquid recovery. Mr. Godick is responsible for the development of the remedial work plans, design/construction documents, landscape architecture, confirmatory sampling, air monitoring, supervision, and preparation of close-out documentation in accordance with NYSDEC requirements. Work is anticipated to be completed in 2009.

Site Investigation & Remediation–Former Manufactured Gas Plant (MGP), Confidential Client, Westchester County, NY

The site is currently an active retail shopping center. Previously, the site had been utilized as a large former MGP. The project entailed the implementation of a large-scale remedial investigation that addressed the assessment and remediation of occupied buildings, as well as the potential of future redevelopment of the site. Future remediation will consist of hot spot removal, product recovery, and groundwater containment measures. Other engineering and institution controls will also be implemented. Specific role?

Underground Storage Tank Closure and Site Remediation–Program Management, Con Edison, New York, NY

Mr. Godick provided technical assistance to Con Edison in developing technical submittals and budgets associated with tank closures at over 50 facilities. Technical summaries were prepared for submittal of contractor-prepared closure reports to the NYSDEC. The summaries included a review of historic pre-closure assessments, tank closure data, and provided recommendations for additional assessment, remediation or closure. Subsequently, a three-year program budget was developed for implementation of the UST investigation/remedial program, which Con Edison utilized for internal budgeting purposes.

Site Investigation–Over 20 Facilities, Con Edison, New York, NY

Mr. Godick managed site investigations associated with petroleum, dielectric fluid, and PCB releases at over 20 Con Edison facilities including service centers, substations, generating stations, and underground transmission and distribution systems. Site investigations have included due diligence site reviews, soil boring installation, monitoring well installation, hydrogeologic testing, and water quality sampling. Risk-based closures have been proposed for several sites.

Site Investigation–7 World Trade Center Substation, Con Edison, New York, NY

Mr. Godick managed the site investigation at the former 7 World Trade Center Substation in an effort to delineate and recover approximately 140,000 gallons of transformer and feeder oil following the collapse of the building. The project involved coordination with several crews, Con Edison, and other site personnel.

Site Investigation–Former Manufactured Gas Plant (MGP) Facilities, Con Edison, New York, NY

Mr. Godick managed site investigations at four former MGP facilities. The investigations at three of the four sites were completed at a Con Edison substation, flush pit facility, and service center, respectively. The details associated with the fourth site are confidential. Site characterizations at the substation and flush pit facility were conducted in preparation of expansion at these locations. The findings from these characterizations were used by Con Edison to make appropriate changes to the design specifications and to plan for appropriate handling of impacted materials and health and safety protocols during future construction activities.

Ground Water Monitoring–Over 20 Facilities, Con Edison, New York, NY

Mr. Godick managed a multi-site contract for ground water monitoring at over 20 facilities throughout Con Edison's footprint at service centers, substations, generating stations, transmission/distribution, and major oil storage facilities (MOSF) sites.

Verizon, Investigation & Remediation, Various Locations, NY, PA and DE

Mr. Godick managed over 50 geologic/hydrogeologic assessments and site remediation projects related to petroleum releases at various facilities. Responsibilities included annual budgeting, day-to-day project management, development and implementation of soil and ground water investigation workplans, ground water modeling, risk evaluation, remedial action work plans, remedial design, system installation, waste disposal, well abandonment, and operation and maintenance. Many of the assessment and remedial projects followed a risk-based approach. Remedial technologies implemented included air sparging, soil vapor extraction, bioremediation, pump and treat, soil excavation, and natural attenuation.

Site Investigation, Risk Assessment and Remediation, Thermadyne Holding Company, Danvers, MA

Mr. Godick managed a remedial investigation and ground water remediation program for a former manufacturing facility in Massachusetts. The project included the design and installation of a ground water remedial system for chlorinated solvent impact within a complex fractured bedrock aquifer. Responsibilities included the review of historic data, collection of extensive new groundwater data, completion of pump testing, computer modeling of the bedrock aquifer, remedial system pilot testing, system design, O&M, waste disposal, and preparation of all necessary reports to the State. To facilitate the closure of the site, a Risk Characterization Report was prepared under the Massachusetts Contingency Plan.

Groundwater and Soil Remediation, BP Oil Company, Various Locations, NJ and PA

Mr. Godick provided support to environmental activities for BP Oil Company in Pennsylvania and New Jersey. Responsibilities included completion of remedial investigations, preparation of remedial action plans, quarterly ground water sampling, and reporting.

Multimedia Compliance and Remediation, Greenburgh Central School District No. 7, Hartsdale, NY

Mr. Godick implemented a multimedia program to address regulatory compliance and remediation at the transportation yard and other facilities. The compliance program included development of an environmental management system including periodic auditing, standard operating procedures, release reporting, and training. Designed and implemented engineering controls and monitoring to satisfy stormwater requirements. Remediation was conducted to address petroleum and solvent contamination from former underground storage tanks and dry wells, which included source removal and natural attenuation of groundwater. Provided support in connection with litigation from the adjoining property owner.

Preliminary Impact Assessment, Proposed Wildlife Refuge and Ecology Center, BASF Corporation, Kearny, NJ

Mr. Godick managed a preliminary environmental impact assessment at the location of a former BASF facility. Adjacent to the property is an expanse of mudflats that contained heavy metals, PAHs, PCBs, dioxins and other contaminants originating from numerous point and non-point sources. BASF proposed to cap these mudflats with clean sediments, and to develop a salt marsh wildlife refuge having an area of approximately 180 acres on the remediated portion. A workplan was developed and implemented, which included fish and benthic testing to evaluate whether winter flounder used the mudflat as a spawning area, and to evaluate whether winter flounder or summer flounder may utilize the mudflat as a juvenile rearing area. The benthic invertebrate and fish sampling data indicated that significant winter and summer flounder were not present at the subject site.

Environmental Assessment, Confidential Client, Flexible Packaging Division, Various Locations

Mr. Godick conducted Phase I ESAs and compliance reviews for a major international chemical company, which was divesting their flexible polyethylene packaging division. This program was completed by the seller to provide accurate and appropriate assessment information to a number of potential purchasers. All assessments were completed on a confidential basis with a completed report provided to the client within three weeks from the date of the first site visit.

Environmental Assessment, Polyurethane Foam Manufacturing Company, Various Locations

Mr. Godick conducted Phase I ESAs and compliance reviews at a major polyurethane and polystyrene foam manufacturer with locations throughout the U.S. The program evaluated all environmental aspects of the operation with a summary of potential and material liabilities provided to the client prior to the acquisition. Issues addressed, with estimates as to operational and remedial costs provided, included air emissions, regulatory compliance with historic consent orders, projected plant upgrades required for future compliance, and potential liabilities associated with identified environmental contamination.

Environmental Assessment, Copper Wire Manufacturer, Various Locations

Mr. Godick conducted Phase I ESAs and compliance reviews at multiple wire manufacturing sites, which were evaluated as part of an acquisition by an international manufacturing company. A comprehensive evaluation of each plant was performed with plant sizes ranging from 100,000 to 800,000 square feet. Final reports were delivered to the client within 30 days following the initial site visit.

Litigation Support & Remediation, Former Service Station, Brooklyn, New York

Mr. Godick took over management of remediation of an inactive service station (formerly conducted by another firm). His approach outlined additional characterization and remediation efforts which resulted in successful closure of the spill by NYSDEC within two years. Mr. Godick testified as an expert witness at a hearing in the New York State Supreme Court of Kings County to determine the adequacy of the remediation efforts.

Litigation Support & Remediation, Residential Heating Oil Spill, Cranford, New Jersey

Mr. Godick took over management of remediation of a heating oil spill in the basement of a single family residence on behalf of the insurance company. Up until Mr. Godick taking over the remediation, several hundred thousand dollars had been spent on remediation with no resolution of the spill with the NJDEP and homeowners. His approach outlined additional characterization and remediation efforts to expeditiously and cost-effectively resolve the spill.

Litigation Support, Cost Recovery Action, Town of Carmel, New York

Mr. Godick served as an expert witness representing the owner of a property in a landlord-tenant dispute, which was used as a gasoline station and oil change facility. Mr. Godick prepared exhibits, testified, and participated in meetings with NYSDEC to support the landlord's claim that the oil change tenant's practices were poor and were adversely affecting the environment and the overall facility systems at the site.

Litigation Support, Cost Recovery Action, New York State Superfund Site

Mr. Godick provided technical support for the former owner of a New York State Superfund site in upstate New York. Current owner of the property brought a cost recovery action against client as a potential responsibility party. Completed technical review of draft Remedial Investigation/Feasibility Study prepared by opposing party's consultant to develop more cost effective remedial strategy and to better position the client for liability allocation as part of future settlement negotiations. Developed cost allocation paper and model for settlement negotiations. Participated in mediation process.

Litigation Support, Cost Recovery Action, New York State Petroleum Spill Site, New York, NY

Mr. Godick provided technical support for the former owner of a New York City multi-unit residential apartment building. The State of New York brought a cost recovery action against our client as a result of a previous spill from a former underground storage tank. Reviewed invoices and project documentation to dispute work performed by the NYSDEC, which provided the basis for settlement at a fraction of the initial claim.

Cost Analysis, Environmental Insurance Claims, Various Locations

Mr. Godick provided technical support for cost analyses completed for a large national insurance company related to several former MGP and other industrial sites. Responsibilities included evaluation and development of cost-effective remedial strategies, as well as compilation of detailed costs for remedial action implementation and closure.

Litigation Support, Class Action Lawsuit, Confidential Client, NJ

Mr. Godick provided technical support for a class action suit involving a petroleum-impacted community water supply in southern New Jersey. The technical assistance included analysis of expert testimony and coordination with legal counsel in preparing for cross-examination of the opposing party's lead expert witness.

Storage Tank Management, Verizon, Various Locations, NY, PA, DE, and MA

Mr. Godick managed the removal and replacement of underground and aboveground storage tank systems for Verizon in New York, Pennsylvania, Delaware, and Massachusetts. Responsibilities included the management of design, preparation of specifications, contractor bidding, construction oversight, project budget, and documentation. For selected AST sites, managed the development of Spill Control, Contingency and Countermeasures (SPCC) plans.

Storage Tank Management, Citibank, N.A., New York, NY

Mr. Godick managed a storage tank replacement project for a facility located on Wall Street in New York City. The existing underground storage tank was closed in place and replaced with a field-constructed AST system within the building. The project required zero tolerance for service interruptions, disruptions to building operations, or disturbance to occupants of the office space neighboring the new tank location. Responsibilities included the management of design, preparation of specifications, contractor bidding, construction inspections, site assessment for closed-in-place UST, SPCC plan preparation, and responsibility for project budget and documentation.

KATHLEEN BRUNNER

TECHNICAL DIRECTOR

Kathleen Brunner is a Technical Director with more than 12 years of professional environmental consulting experience. She specializes in environmental site assessments and investigations, site remediation, and hazardous materials planning studies. Ms. Brunner has extensive experience performing Phase I and II environmental site assessments, directing and overseeing site remediation projects, and addressing the hazardous materials aspects of Environmental Impact Statements (EISs).

Ms. Brunner's experience includes supervising the installation of soil borings and groundwater monitoring wells; sampling soil, groundwater, air and soil gas; maintaining and sampling groundwater remediation systems, and overseeing and directing construction-related soil management plans and environmental remediation projects. Her range of project experience includes preparation of proposals, sampling protocols, work plans, health and safety plans, site investigation reports, and closure requests, as well as project scheduling and budgeting. Ms. Brunner has coordinated work and acted as a liaison between clients, property owners, subcontractors, and regulatory agencies on City, State and Federal levels.

Prior to joining AKRF, Ms. Brunner worked for a multidisciplinary consulting firm at their offices in Pewaukee, Wisconsin and New York, New York as an environmental scientist.

BACKGROUND

Education

B.A., Physical Geography, University of Wisconsin – Milwaukee, 1995

Licenses/Certifications

40-Hr Hazardous Waste Operations Site Worker, 1997 to present

New York State Certified Asbestos Inspector, 2004 to present

Professional Memberships

Years of Experience

Year started in company: 2004

Year started in industry: 1996

RELEVANT EXPERIENCE

C.E. Flushing Site, Flushing, NY

Ms. Brunner is managing and coordinating the investigation, remediation and post-remediation monitoring of a former industrial site in Flushing, Queens, NY as part of redevelopment of the property. The investigation included groundwater sampling, delineation of known areas of soil contamination, and delineating PCB-containing non-aqueous phase liquid (NAPL). Remedial activities included removal of aboveground and underground storage tanks, NAPL product removal, removal of on-site drainage structures, and excavation of delineated hot spots, including hazardous and non-hazardous waste streams. Ms. Brunner assisted in the preparation of the application for this site to transfer from the New York State Department of Environmental Conservation's (NYSDEC) Voluntary Cleanup Program to the Brownfield Cleanup Program (BCP). Ms. Brunner 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. Remediation was completed in 2007 and Certificates of Completion under the BCP were issued in December 2007. Post-remediation monitoring includes oversight of construction-related soil disturbance, quarterly groundwater and vapor sampling, and continued annual reporting to NYSDEC and NYSDOH. Ms. Brunner also assisted coordination with the New York City Department of Environmental Protection (NYCDEP) due to an E-designation on the property. As part of the project, Ms. Brunner coordinated with the client, lawyers, architects and engineers of the planned development, tenants of a neighboring property, remediation and construction contractors, US Environmental Protection Agency (USEPA), NYSDEC, NYSDOH, and NYCDEP.

Brownfield Opportunity Area (BOA) Grant Program Services for the Town of Babylon, Wyandanch, NY

AKRF was retained by the Town of Babylon to prepare a blight study, market study, NYS BOA Step 2 Nomination, an Urban Renewal Plan, and a Generic Environmental Impact Statement (GEIS) as part of a revitalization and redevelopment effort for downtown Wyandanch. Ms. Brunner was responsible for overseeing the environmental data collection effort for the 226 brownfields identified in the 105-acre project area, and for identifying strategic sites for which site assessment funding should be sought. She also prepared the Hazardous Materials section of the Wyandanch Downtown Revitalization Plan (which incorporates the Nomination, Urban Renewal Plan, and GEIS), involving a summary of available environmental reports, a review of regulatory records, and limited street-level site inspections.

Fresh Kills Park, Staten Island, NY

AKRF is preparing the Generic Environmental Impact Statement (GEIS) for this large-scale, multi-phase project to turn the former Fresh Kills Landfill into a public park. The project involves New York City Department of Sanitation and Department of Parks with regulatory oversight and approval by both NYCDEP and NYSDEC. As part of the hazardous materials chapter for the GEIS, Ms. Brunner researched site history, performed a regulatory records review and prepared a data summary and recommendations for mitigation of potential future impacts.

Atlantic Yards Arena and Redevelopment Project, Brooklyn, NY

AKRF prepared the Environmental Impact Statement (EIS) and Blight Study for this ambitious and controversial land use initiative. The project, overseen by the Empire State Development Corporation (ESDC), calls for the redevelopment of an underutilized and underdeveloped 22-acre site in the Atlantic Terminal area of Brooklyn, adjacent to Downtown Brooklyn. The project includes a new arena for the Nets basketball team, along with mixed-income residential, commercial office, retail, hotel, and community facility uses. The total project cost is estimated at $4.5 billion. Key issues addressed in the EIS include: potential impacts on water quality in the Gowanus Canal and East River; concerns over land use compatibility and urban design; potential adverse traffic and air quality impacts; and potential adverse effects on socioeconomic conditions in the study area. In addition, the EIS presented a detailed description of construction activities and phasing, and an analysis of potential averse impacts during project construction. The FEIS was issued in December, 2006. Ms. Brunner served on a team of Hazmat staff conducting Phase I Environmental Site Assessments in accordance with ASTM E-1527-00 related to the potential development of up to 8 city blocks. As part of the study, Ms. Brunner coordinated with the client, property owners or their representatives, and tenants. Her work scope included site reconnaissance, site history and records review, interviews, report preparation, recommendations and data summary to be used in preparation of the EIS chapter.

Algin West 61st Street Site, New York, NY

Ms. Brunner prepared of the application and Citizen Participation Plan for this site to participate in the NYSDEC's Brownfield Cleanup Program. As part of this project, Ms. Brunner prepared and developed an investigation work plan for approval by the NYSDEC and prepared of summary fact sheets for public review. Ms.

Brunner coordinated with the client, lawyers, NYSDEC, property owners or their representatives, and the contractor for the planned development.

Edgemere By the Sea, Rockaway, NY

Ms. Brunner performed a Phase I Environmental Site Assessment of 73 city lots located on nine blocks in accordance with ASTM E-1527-00 related to the potential development of the area. Her work scope included site reconnaissance, site history and records review, interviews, report preparation and recommendations. Based on the findings in the Phase I, Phase II was performed. Ms. Brunner coordinated and oversaw soil boring installation and collected soil and groundwater samples.

Fulton Street Transit Center, New York, NY

While working with another firm, Ms. Brunner worked with a multi-company project team assisting with work pertaining to subsurface environmental issues. Ms. Brunner provided general environmental oversight of soil borings, collected groundwater samples from wells, conducted rising head slug tests, and calculated hydraulic conductivity estimates. She prepared the Health and Safety Plan, environmental portions of the work plan, and the Environmental Subsurface Investigation Plan.

DaimlerChrysler, Kenosha, WI

While with another firm, Ms. Brunner assisted in multiple phases of work at an approximately 100-acre DaimlerChrysler manufacturing facility. During construction of a new building, Ms. Brunner observed excavation activities, directed contaminated soil excavation, and managed dewatering treatment and discharge. Post-construction, Ms. Brunner assisted in the reconstruction of two groundwater remediation systems and an SVE system, including plumbing an oil water separator and stripper, and installing appropriate venting and sampling ports. Ms. Brunner also assisted in equipment start-up and subsequent troubleshooting and sampling of influent and effluent. On a quarterly basis, routine and troubleshooting maintenance work was performed on the pumps, flow meters, strippers, oil/water separators and other system components for six remediation systems. Ms. Brunner also directed and documented monitoring well installation, collected groundwater samples from up to 50 monitoring wells and sumps, and air samples from soil vapor extraction systems, reviewed and summarized field and laboratory data, and assisted in writing semi-annual and annual reports for this facility. Report preparation included quality assurance calculations, determination of quantity of free product and dissolved phase contaminant removal, and project narrative of activities completed during the reporting period.

MARCUS SIMONS

SENIOR VICE PRESIDENT

General Introduction

Marcus Simons is a Senior Vice President of AKRF with more than 18 years of experience in environmental consulting. He specializes in the assessment and cleanup of contaminated sites, including federal and state superfund, Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA) sites, 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 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.

Mr. Simons manages much of the environmental due diligence activity at AKRF (most 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 also manages preparation of the contaminated-materials portions of AKRF's Environmental Impact Statements and Environmental Assessments.

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 being constructed; 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). These projects involved extensive multi-year negotiations with federal, state and city regulatory agencies. Mr. Simons has experience with federal and state superfund programs, state brownfield and voluntary cleanup programs, spill programs and investigation/cleanup under New York SEQRA/CEQR and NYCDEP E-designation programs.

Mr. Simons also has extensive experience in the evaluation of contaminated materials issues for environmental assessments (EAs) and environmental impact statements (EISs) under NEPA, SEQRA and CEQR, including 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 (Times Square, School Construction Authority, Queens West)

Before joining AKRF, Mr. Simons worked for Woodward Clyde Consultants (now URS Corporation) in Wayne, New Jersey, where he was responsible for risk assessment, environmental impact analysis, and regulatory analysis for both public and private clients. His responsibilities included projects primarily located in New York and New Jersey. His risk assessment work included a study for the decommissioning and cleanup of a Canadian elemental phosphorus production facility (the first such plant in the world to be systematically decommissioned).

BACKGROUND

Education

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

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

Years of Experience

Year started in company: 1995

Year started in industry: 1988

RELEVANT EXPERIENCE

Pelham Bay Landfill, Bronx, NY

For the NYCDEP, Mr. Simons prepared a Human Health Risk Assessment for the Pelham Bay Landfill Inactive Hazardous Waste Disposal Site in Bronx, NY. The Assessment was performed in accordance with both US EPA Superfund Guidelines and site-specific exposure factors and other procedures agreed to with NYSDEC and NYSDOH. The Assessment included analysis of soil, groundwater, surface water, sediment, fish/shellfish and air data and incorporated complex comparisons with background contaminant levels in the various media and innovative approaches, following the data validation, to handling extensive non-detect and estimated-value laboratory data .

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.

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.

Long Island City Rezoning, Queens, NY

As part of the preparation of an Environmental Impact Statement for NYC Department of City Planning, Mr. Simons managed the hazardous materials assessment of a multi-block industrial 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 is managing the investigation and remediation of an old factory complex where large volumes of creosote were spilled. The investigations and interim remedial measures (IRMs) are taking place under the state's Voluntary Cleanup Program (VCP).

Pelham Plaza Shopping Center, Pelham Manor, Bronx, NY

Mr. Simons was responsible for the investigation of a former Con Edison manufactured gas facility on the Hutchinson River on the border between Westchester County and the Bronx. He oversaw the complex investigation of the existing shopping center at the site, and proposed a remediation approach to allow the expansion of the shopping center.

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.

Lorie MacKinnon
113 Odell Road
Sandown, NH 03873
(603)974-0939

PROPOSED PROJECT ASSIGNMENT: Data Validation Chemist

PROFESSIONAL QUALIFICATIONS

Ms. MacKinnon has 22 years of experience encompassing:

- Data Validation
- Laboratory QA/QC
- Preparation and Analysis of Environmental Samples

REPRESENTATIVE EXPERIENCE

Data Validation

Performed data validation for organic parameters including VOCs, SVOCs, Pesticides/PCBs, Dioxins, specialty analyses including GC/MS/SIM and various air analyses and inorganic parameters including metals, cyanide, and various wet chemistry analyses. Validation and reporting guidelines utilized include EPA National Functional Guidelines, EPA Regions I and II, and NJDEP.

GEI Consultants, Glastonbury, CT - June 1993 to present.
Performing data validation in accordance with USEPA Region I and Region II, USEPA National Functional Guidelines, and New Jersey DEP Guidelines.

TRC Environmental Corporation, Lowell, MA - 1997 to present.
Performing data validation in accordance with USEPA Region I and Region II, USEPA National Functional Guidelines, and New Jersey DEP Guidelines.

Jacques Whitford, Old Saybrook, CT - March 2002 to 2004.
Performing data validation in accordance with USEPA National Functional Guidelines.

Lockheed Martin, Lowell, MA - June 2003 to 2004.
Performing data validation in accordance with USEPA Region I Guidelines.

Jacobs Engineering Group, Inc., OTIS ANG Base, MA - December 1996 to January 1999.
Performed data validation in accordance with Jacobs modified Region I guidelines.

Laboratory QA/QC and Preparation and Analysis of Environmental Samples

National Environmental Testing, Bedford, MA

Inorganic CLP Coordinator, November 1993 to February 1994. Temporarily replaced coordinator while on maternity leave. Responsible for CLP data management and data package review for the inorganic laboratory to assure a high level of data quality.

Quality Assurance Coordinator, July 1993 to October 1993. Temporarily replace coordinator while on maternity leave. Responsible for developing and overseeing the laboratory quality assurance and quality control practices to ensure that a high level of data quality is achieved. Responsible for the submission of performance evaluation samples from external regulating agencies and managing a program of internal performance evaluation audits for the Cambridge Division and subcontract laboratories. Acted as the primary contact for state and program-specific certifications programs, and as such was responsible for communicating all audit and PE sample results and corrective action responses.

Consultant, February 1993 to June 1993. Performed methods development and validation for EPA Method 218.6, Hexavalent Chromium Analysis by High Performance Liquid Chromatography and EPA Method 610, Polynuclear Aromatic Hydrocarbon Analysis by High Performance Liquid Chromatography. Developed standard operating procedures for both methods allowing NET to offer these analytical procedures as routine services.

Supervisor, Wet Chemistry Laboratory, March 1991 to June 1992. Oversaw training and performance of all laboratory technicians, as well as troubleshooting and instrument maintenance. Duties also included the scheduling of inorganic work in house and the reviewing and reporting of all analytical results. Responsible for the preparation, analysis, and reporting of cyanide under USEPA CLP protocol.

Project Manager, June 1990 to March 1991. Responsibilities included defining the scope of work with a variety of industrial, engineering and governmental clients, developing price quotations, outlining the required quality control/quality assurance, arranging sampling and analytical schedules with the laboratory director and managers, and monitoring the project to its completion, including data review and report production.

Lead Project Chemist, May 1989 to March 1990. Performed method development, validation, and residue analysis for several pesticide registration studies. Analyses included use of gas chromatography and high performance liquid chromatography.

Associate Scientist, May 1987 to March 1989. Performed inorganic analyses on environmental and industrial samples. Analytical skills included quantitation of analytes by inductively coupled argon emission spectroscopy and atomic absorption spectroscopy under USEPA CLP protocols.

EDUCATION

B.A., Chemistry, Boston University, 1987

APPENDIX B
HEALTH AND SAFETY PLAN

2350 Fifth Avenue

Site #2-31-004

NEW YORK, NEW YORK

Health and Safety Plan

AKRF Project Number: 08010

Prepared for:

2350 Fifth Avenue Corporation
309 East 94th Street
Ground Floor
New York, New York 10128

Prepared by:

AKRF

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

JANURARY 2009

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1.0 INTRODUCTION

The site is located in the Harlem section of Manhattan, bounded by Fifth Avenue on the east, West 141st Street on the south, a garage and paved parking area on the west, and West 142nd Street on the north. (See Figure 1 for the project site location.) The western boundary of the site is about 50 feet east of Chisum Place. The site extends about 200 feet north-south and about 345 feet east-west. The Harlem River is 100 to 200 feet to the east of the site.

The site is occupied by a building comprising three connected sections: a two-story section along Fifth Avenue, a three-story section in the center of the site, and a one-story section to the west. There are high-rise residential buildings on the blocks to the west, south, and southeast of the site. The Harlem River Drive is to the northeast, and a National Guard Armory occupies the block to the north, between West 142nd and West 143rd Streets.

This environmental Health and Safety Plan (HASP) has been developed for implementation of site investigation activities conducted by all personnel on-site, both AKRF employees and others. This HASP does not discuss other routine health and safety issues common to general construction/excavation, including but not limited to slips, trips, falls, shoring, and other physical hazards.

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

1.1 Site History

The existing building was originally constructed in segments as an ice cream factory by the Bordens Ice Cream Company. The three-story section was built in 1923; the two-story section was built in 1932; and the one-story section was built in 1950. The floor slab at the western end of the building (the one-story section built in 1950) was constructed with various layers of insulating materials related to the original use of the building as a refrigerated ice cream plant. At the westernmost section of the building, there was most typically a layer of tarpaper directly under the slab, with a thin (two inches or less) layer of cork underneath. Under the cork was a layer of Styrofoam eight to ten inches thick. Under the Styrofoam was a layer of fill, more tarpaper, and another concrete slab about four inches thick. There was fill beneath this slab, and at some locations brick and/or other concrete slabs were encountered within the fill. These were probably remains of earlier structures. An area just east of the section with the cork/Styrofoam insulation had a thicker layer of cork four to ten inches thick under the slab, but no Styrofoam. The insulation material was identified only beneath the western portion of the building used for refrigeration.

Following its use as an ice cream factory, the building was occupied by a commercial laundry from 1970 to 1994. The laundry operated under a variety of names including Budge-Wood Service, Bluebird Laundry, and Swiss-American Laundry. The facility included a dry cleaning operation utilizing tetrachloroethene (PCE) as a cleaning solvent. The dry cleaning operation was located near the northern side of the one-story portion of the building, in the former refrigerated portion of the building just west of the West 142nd Street loading dock. PCE was stored in the same area. The operations initially used first-generation machines with separate washers and dryers. Around 1984, these were replaced by second-generation machines, which were single units that perform all of the washing, extraction, and drying operations. It was likely that most of the on-site leaks and spills of PCE were associated with the use of the first generation machines, which involved more handling of PCE than the later machines. The facility had an U.S. Environmental Protection Agency (EPA) ID number as a generator of hazardous waste (NYD071026173).

There is one out-of-service underground fuel oil tank on the site, located under the West 142nd Street loading dock, immediately to the east of the former dry cleaning area.

A remedial investigation was performed on the subject site from 1996 to 2008 with several phases of groundwater, soil, soil vapor and indoor air sampling. The major contaminant of concern identified on the site was PCE and its breakdown products (trichloroethene, dichloroethene, and vinyl chloride), which appears to be largely limited to the northwestern portion of the site in and around the area of the former dry cleaning activities. Some evidence of petroleum contamination was also detected.

1.2 Scope of Work

The scope of work covered under this HASP includes supplemental soil gas and groundwater sampling.

1.2.1 Supplemental Investigation

A Supplemental Remedial Investigation Work Plan (SRIWP) has been prepared for additional investigation. The supplemental investigation comprises the following tasks which will be carried out to further delineate areas of contamination and local groundwater flow:

- Installation of soil vapor wells on immediately adjacent blocks;
- Installation of additional site monitoring wells; and
- Sampling of soil vapor and groundwater monitoring wells.

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	( ) Inorganic Chemicals	( ) Radiological
( ) Biological	( ) Explosive/Flammable	( ) Oxygen Deficient Atm
( ) Heat Stress	( ) 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	( ) Halogens	( ) Transformer	( ) Lab
( ) Caustics	( ) Asbestos	( ) Metals	( ) Petroleum	( ) Other DF	( ) Pharm
( ) Pesticides	( ) Tailings	( ) POTW	( ) Other	( ) Motor or Hydraulic Oil	( ) Hospital
(X) Petroleum	( ) Other	( ) Other		( ) Gasoline	( ) Rad
( ) Inks				( ) Fuel Oil	( ) MGP
( ) PCBs					( ) Mold
( ) Metals					( ) Cyanide
(X)Other: VOCs & SVOCs					

2.1.4 Potential Chemicals of Concern

Chemical	REL/PEL/STEL (ppm)	Health Hazards
Tetrachloroethene	PEL = 100 ppm Ceiling = 200 ppm Five minute max peak in any 3 hours = 300 ppm	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.
Trichloroethene	PEL = 100 ppm Ceiling = 200 ppm Five minute max peak in any 3 hours = 300 ppm	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.
Dichloroethene	PEL = 100 ppm Ceiling = 200 ppm Five minute max peak in any 3 hours = 300 ppm	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.
Vinyl Chloride	PEL = 1 ppm Ceiling = 5 ppm	Breathing high levels of vinyl chloride for short periods of time can cause dizziness, sleepiness, unconsciousness, and at extremely high levels can cause death. Breathing vinyl chloride for long periods of time can result in permanent liver damage, immune reactions, nerve damage, and liver cancer.
PAHs	REL = 0.1 mg/m^3 PEL = 5.0 mg/m^3	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. The Department of Health and Human Services has determined that some PAHs may reasonably be expected to be carcinogens.

Chemical	REL/PEL/STEL (ppm)	Health Hazards
Particulate	PEL = 15 mg/m^3 (total) PEL = 5 mg/m^3(respirable)	Irritation eyes, skin, throat, upper respiratory system.
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 enter the work area while intrusive activities are being performed will have completed a 40-hour training course that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. In addition, all personnel will have up-to-date 8-hour refresher training. The training will allow personnel to recognize and understand the potential hazards to health and safety. All field personnel must attend a training program, whose purpose is to:

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

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

Task	Exclusion Zone	CRZ	Support Zone
Soil Borings	10 ft from Drill Rig	25 ft from Drill Rig	As Needed
Well Installation	10 ft from Drill Rig	25 ft from Drill Rig	As Needed
Groundwater Sampling	10 ft from monitoring well	As needed	As needed
Soil Vapor Monitoring/Sampling	10 ft from monitoring well	As needed	As needed
Comments: Control measures such as "caution tape" and/or traffic cones will be placed around the perimeter of the work area when work is being done in a public area.			

2.6 Air Monitoring

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

2.6.1 Volatile Organic Compounds

An organic vapor meter (OVM) will be used to perform air monitoring during soil disturbance activities to determine airborne levels of total VOCs. The OVM will be calibrated daily with a 100 ppm isobutylene standard.

2.6.2 Work Zone Air Monitoring

Real time air monitoring will be performed as necessary with a photoionization detector (PID) during sampling, drilling work at areas where volatile organic compounds are detected. Monitoring with a particulate air monitor will be conducted, as necessary, during drilling and other earth moving activities. Measurements would be taken prior to commencement of work and continuously during the work as outlined in the table below. Measurements will be made as close to the workers as practical and at the breathing height of the workers. The SSO will set up the equipment and confirm that it is working properly. His/her designee may oversee the air measurements during the day. The initial measurement for the day will be performed before the start of work and will establish the background level for that day. The final measurement for the day will be performed after the end of work.

The action levels and required responses are listed in the following table:

Instrument	Task to be monitored	Action Level (Note 1)	Response Action
PID	All tasks	Less than 10 ppm in breathing zone.	Level D or D-Modified
		Between 10 and 100 ppm Half-face mask to 50 ppm (max.) Full-face mask to 100 ppm	Level C
		More than 100 ppm	Stop work. Resume work when readings are less than 500 ppm.
Particulate monitor	All soil disturbing tasks	Less than 5 mg/m^3	Level D
		Between 5 mg/m^3 and 125 mg/m^3	Level C. Apply dust suppression measures. If <2.5 mg/m^3, resume work using Level D. Otherwise, use Level C.
		Above 125 mg/m^3	Stop work. Apply additional dust suppression measures. Resume work when less than 125 mg/m^3.

Notes:
1 – 15-minute time-weighted average.
ppm – parts per million
mg/m^3 – milligrams per cubic meter
LEL – lower explosive limit

2.7 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 Section 2.6.

LEVEL OF PROTECTION & PPE		**Drilling**	**Groundwater Sampling**
Level D (X) Steel Toe Shoes (X) Hard Hat (within 25 ft of drill rig) (X) Work Gloves	(X) Safety Glasses ( ) Face Shield (X) Ear Plugs (within 25 ft of drill rig) (X) Latex Gloves	Yes	Yes
Level D – Modified ***(in addition to Level D)*** (X) Tyvek Coveralls -or-	(X) Nitrile Gloves ( ) Overboots (X) Saranex Coveralls	Potential direct contact with soil or groundwater	Potential direct contact with soil or groundwater
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)	If PID > 10 ppm (breathing zone)
Comments: Respirator cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breath or any odors detected).			

2.8 General Work Practices

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

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the site. These areas will be designated by the SSO.
- Workers must wash their hands thoroughly 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 a hospital by on-site personnel. Directions to the hospital are provided below, and a hospital route map is attached.

3.1 Hospital Directions

Hospital Name:	Harlem Hospital Center
Phone Number:	(212) 939-1000
Address/Location:	506 Lenox Avenue – New York, New York (Lenox Avenue between 135th Street and 136th Street)
Directions:	Go SOUTH on 5th Avenue to *West 135th Street* RIGHT onto *135th Street* RIGHT onto *Lenox Avenue* The hospital will be on the right.

3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Marc Godick	Project Director	914-922-2356 (office)
	Kathleen Brunner	Project Manager	646-388-9525 (office) 917-612-3990 (cell)
	Eric Park	SSO	646-388-9532(office) 917-923-9182 (cell)
2350 Fifth Avenue Corporation	Joseph Karten	Client Representative	212-289-4551
NYSDEC	Bryan Wong	Project Manager	718-482-4905
NYSDOH	Dawn Hettrick	Project Manager	518-402-7880
Driller	To Be Determined		
Ambulance, Fire Department & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	800-457-7362

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 2350 Fifth Avenue 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:	
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Signed:		Company:		Date:	
Signed:		Company:		Date:	
Signed:		Company:		Date:	
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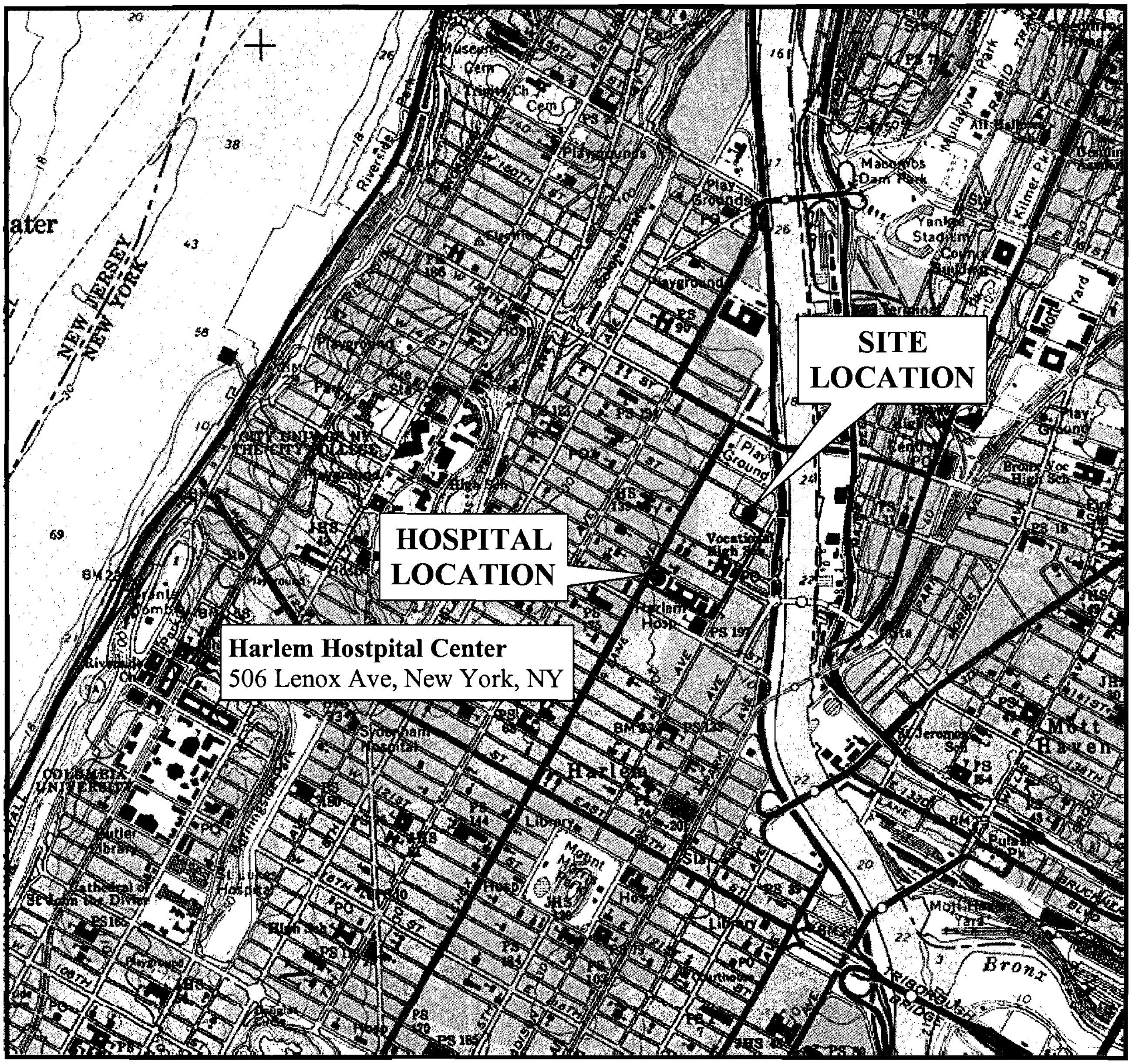
FIGURES



SCALE IN FEET

0' 1000' 2000' 4000'

SCALE: 1"=2000'

N

SOURCE:
7.5 MINUTE SERIES USGS TOPOGRAPHIC MAP
QUADRANGLE: CENTRAL PARK, NY 1995

2350 5th AVENUE
NEW YORK, NEW YORK

HOSPITAL LOCATION MAP

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

DATE
10.30.07

PROJECT No.
08010

SCALE
AS SHOWN

FIGURE
1

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APPENDIX A

POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

BENZENE
CAS # 71-43-2

Agency for Toxic Substances and Disease Registry ToxFAQs September 1997

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

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

What is benzene?
(Pronounced bĕn′zēn′)

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

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

What happens to benzene when it enters the environment?

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

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

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

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

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

☐ Benzene does not build up in plants or animals.

How might I be exposed to benzene?

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

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

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

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

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

☐ A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

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

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

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

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

How likely is benzene to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

Glossary

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

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

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

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

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

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

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

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 *trans*-) was not specified.

What is 1,2-dichloroethene?

(Pronounced 1,2-dī-klôr′ ō-ēth′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.

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

ETHYLBENZENE

CAS # 100-41-4

Agency for Toxic Substances and Disease Registry ToxFAQs June 1999

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

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

What is ethylbenzene?

(Pronounced ĕth′ əl bĕn′ zēn′)

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

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

What happens to ethylbenzene when it enters the environment?

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

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

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

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

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

How might I be exposed to ethylbenzene?

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

☐ Drinking contaminated tap water.

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

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

How can ethylbenzene affect my health?

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

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

How likely is ethylbenzene to cause cancer?

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

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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AND DISEASE REGISTRY

FUEL OILS

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

Agency for Toxic Substances and Disease Registry ToxFAQs September 1996

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

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

What are fuel oils?

(Pronounced fyo͞o′əl oilz)

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

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

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

What happens to fuel oils when they enter the environment?

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

How might I be exposed to fuel oils?

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

How can fuel oils affect my health?

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

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

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

How likely are fuel oils to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

Glossary

Carcinogenic: Able to cause cancer.
CAS: Chemical Abstracts Service.
Evaporate: To change into a vapor or a gas.
Hydrocarbon: Any compound made up of hydrogen and carbon.
Milligram (mg): One thousandth of a gram.
ppm: Parts per million.
Sediment: Mud and debris that have settled to the bottom of a body of water.

References

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

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop 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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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 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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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.

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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.

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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 hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

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

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

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

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

How can toluene affect children?

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

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

How can families reduce the risk of exposure to toluene?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

References

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

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

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TOTAL PETROLEUM HYDROCARBONS (TPH)

Agency for Toxic Substances and Disease Registry ToxFAQs August 1999

This fact sheet answers the most frequently asked health questions (FAQs) about total petroleum hydrocarbons (TPH). 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: TPH is a mixture of many different compounds. Everyone is exposed to TPH from many sources, including gasoline pumps, spilled oil on pavement, and chemicals used at home or work. Some TPH compounds can affect your nervous system, causing headaches and dizziness. TPH has been found in at least 23 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are total petroleum hydrocarbons?

(Pronounced tōt′l pə-trō′lē-əm hī′drə-kär′bənz)

Total petroleum hydrocarbons (TPH) is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil. Crude oil is used to make petroleum products, which can contaminate the environment. Because there are so many different chemicals in crude oil and in other petroleum products, it is not practical to measure each one separately. However, it is useful to measure the total amount of TPH at a site.

TPH is a mixture of chemicals, but they are all made mainly from hydrogen and carbon, called hydrocarbons. Scientists divide TPH into groups of petroleum hydrocarbons that act alike in soil or water. These groups are called petroleum hydrocarbon fractions. Each fraction contains many individual chemicals.

Some chemicals that may be found in TPH are hexane, jet fuels, mineral oils, benzene, toluene, xylenes, naphthalene, and fluorene, as well as other petroleum products and gasoline components. However, it is likely that samples of TPH will contain only some, or a mixture, of these chemicals.

What happens to TPH when it enters the environment?

☐ TPH may enter the environment through accidents, from industrial releases, or as byproducts from commercial or private uses.
☐ TPH may be released directly into water through spills or leaks.
☐ Some TPH fractions will float on the water and form surface films.
☐ Other TPH fractions will sink to the bottom sediments.
☐ Bacteria and microorganisms in the water may break down some of the TPH fractions.
☐ Some TPH fractions will move into the soil where they may stay for a long time.

How might I be exposed to TPH?

☐ Everyone is exposed to TPH from many sources.
☐ Breathing air at gasoline stations, using chemicals at home or work, or using certain pesticides.
☐ Drinking water contaminated with TPH.
☐ Working in occupations that use petroleum products.
☐ Living in an area near a spill or leak of petroleum products.
☐ Touching soil contaminated with TPH.

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Agency for Toxic Substances and Disease Registry

How can TPH affect my health?

Some of the TPH compounds can affect your central nervous system. One compound can cause headaches and dizziness at high levels in the air. Another compound can cause a nerve disorder called "peripheral neuropathy," consisting of numbness in the feet and legs. Other TPH compounds can cause effects on the blood, immune system, lungs, skin, and eyes.

Animal studies have shown effects on the lungs, central nervous system, liver, and kidney from exposure to TPH compounds. Some TPH compounds have also been shown to affect reproduction and the developing fetus in animals.

How likely is TPH to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that one TPH compound (benzene) is carcinogenic to humans. IARC has determined that other TPH compounds (benzo[a]pyrene and gasoline) are probably and possibly carcinogenic to humans. Most of the other TPH compounds are considered not to be classifiable by IARC.

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

There is no medical test that shows if you have been exposed to TPH. However, there are methods to determine if you have been exposed to some TPH compounds. Exposure to kerosene can be determined by its smell on the breath or clothing. Benzene can be measured in exhaled air and a breakdown product of benzene can be measured in urine. Other TPH compounds can be measured in blood, urine, breath, and some body tissues.

Has the federal government made recommendations to protect human health?

There are no regulations or advisories specific to TPH. The following are recommendations for some of the TPH fractions and compounds:

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 has set an exposure limit of 500 parts of petroleum distillates per million parts of air (500 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Immune system: Body organs and cells that fight disease.

Pesticides: Chemicals used to kill pests.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for total petroleum hydrocarbons (TPH). 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.

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VINYL CHLORIDE

CAS # 75-01-4

Division of Toxicology and Environmental Medicine ToxFAQs™ July 2006

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

HIGHLIGHTS: Exposure to vinyl chloride occurs mainly in the workplace. Breathing high levels of vinyl chloride for short periods of time can cause dizziness, sleepiness, unconsciousness, and at extremely high levels can cause death. Breathing vinyl chloride for long periods of time can result in permanent liver damage, immune reactions, nerve damage, and liver cancer. This substance has been found in at least 616 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is vinyl chloride?

Vinyl chloride is a colorless gas. It burns easily and it is not stable at high temperatures. It has a mild, sweet odor. It is a manufactured substance that does not occur naturally. It can be formed when other substances such as trichloroethane, trichloroethylene, and tetrachloroethylene are broken down. Vinyl chloride is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials.

Vinyl chloride is also known as chloroethene, chloroethylene, and ethylene monochloride.

What happens to vinyl chloride when it enters the environment?

☐ Liquid vinyl chloride evaporates easily. Vinyl chloride in water or soil evaporates rapidly if it is near the surface.
☐ Vinyl chloride in the air breaks down in a few days to other substances, some of which can be harmful.
☐ Small amounts of vinyl chloride can dissolve in water.
☐ Vinyl chloride is unlikely to build up in plants or animals that you might eat.

How might I be exposed to vinyl chloride?

☐ Breathing vinyl chloride that has been released from plastics industries, hazardous waste sites, and landfills.
☐ Breathing vinyl chloride in air or during contact with your skin or eyes in the workplace.
☐ Drinking water from contaminated wells.

How can vinyl chloride affect my health?

Breathing high levels of vinyl chloride can cause you to feel dizzy or sleepy. Breathing very high levels can cause you to pass out, and breathing extremely high levels can cause death.

Some people who have breathed vinyl chloride for several years have changes in the structure of their livers. People are more likely to develop these changes if they breathe high levels of vinyl chloride. Some people who work with vinyl chloride have nerve damage and develop immune reactions. The lowest levels that produce liver changes, nerve damage, and immune reaction in people are not known. Some workers exposed to very high levels of vinyl chloride have problems with the blood flow in their hands. Their fingers turn white and hurt when they go into the cold.

The effects of drinking high levels of vinyl chloride are unknown. If you spill vinyl chloride on your skin, it will cause numbness, redness, and blisters.

Animal studies have shown that long-term exposure to vinyl chloride can damage the sperm and testes.

How likely is vinyl chloride to cause cancer?

The U.S. Department of Health and Human Services has determined that vinyl chloride is a known carcinogen. Studies in workers who have breathed vinyl chloride over many years showed an increased risk of liver, brain, lung cancer, and some cancers of the blood have also been observed in workers.

How can vinyl chloride affect children?

It has not been proven that vinyl chloride causes birth defects in humans, but studies in animals suggest that vinyl chloride might affect growth and development. Animal studies also suggest that infants and young children might be more susceptible than adults to vinyl chloride-induced cancer.

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

Tobacco smoke contains low levels of vinyl chloride, so limiting your family's exposure to cigarette or cigar smoke may help reduce their exposure to vinyl chloride.

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

The results of several tests can sometimes show if you have been exposed to vinyl chloride. Vinyl chloride can be measured in your breath, but the test must be done shortly after exposure. This is not helpful for measuring very low levels of vinyl chloride.

The amount of the major breakdown product of vinyl chloride, thiodiglycolic acid, in the urine may give some information about exposure. However, this test must be done shortly after exposure and does not reliably indicate the level of exposure.

Has the federal government made recommendations to protect human health?

Vinyl chloride is regulated in drinking water, food, and air. The EPA requires that the amount of vinyl chloride in drinking water not exceed 0.002 milligrams per liter (mg/L) of water.

The Occupational Safety and Health Administration (OSHA) has set a limit of 1 part vinyl chloride per 1 million parts of air (1 ppm) in the workplace.

The Food and Drug Administration (FDA) regulates the vinyl chloride content of various plastics. These include plastics that carry liquids and plastics that contact food. The limits for vinyl chloride content vary depending on the nature of the plastic and its use.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Vinyl Chloride (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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

APPENDIX B

REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: ______________ Project Name/Number: ______________________________

Report Date: ______________ Project Manager Name: ______________________________

Summary of any violations of procedures occurring that week:

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

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

Comments:

Name: ______________________ Company: ______________________

Signature: ______________________ Title: ______________________

INCIDENT REPORT FORM

Date of Report: ______________________________

Injured: ______________________________

Employer: ______________________________

Site: ____________________ Site Location: ____________________

Report Prepared By: ____________________ ____________________
Signature Title

ACCIDENT/INCIDENT CATEGORY (check all that applies)

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

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

WITNESS TO ACCIDENT/INCIDENT:

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

INJURED - ILL:

Name: ______________ SSN: ______________________________

Address: ______________ Age: ______________________________

Length of Service: ______________ Time on Present Job: ____________________

Time/Classification: ____

SEVERITY OF INJURY OR ILLNESS:

____ Disabling

____ Medical Treatment

___ Non-disabling

___ First Aid Only

___ Fatality

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: ____________________

NATURE OF INJURY OR ILLNESS: ________________________________

____

____

____

CLASSIFICATION OF INJURY:

__ Abrasions

__ Bites

__ Blisters

__ Bruises

__ Chemical Burns

__ Cold Exposure

__ Concussion

__ Lacerations

_____ Dislocations

_____ Faint/Dizziness

_____ Fractures

_____ Frostbite

_____ Heat Burns

_____ Heat Exhaustion

_____ Heat Stroke

____ Punctures

____ Radiation Burns

____ Respiratory Allergy

____ Sprains

____ Toxic Resp. Exposure

____ Toxic Ingestion

____ Dermal Allergy

Part of Body Affected: ____

Degree of Disability: ____

Date Medical Care was Received: ______________________________

Where Medical Care was Received: _____________________________

Address (if off-site): ____

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

PROPERTY DAMAGE:

Description of Damage: ______________________________

____

Cost of Damage: $ ______________________________

ACCIDENT/INCIDENT LOCATION: ______________________________

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

____

____

____

____

Was weather a factor?:______________________________

____

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

____

____

____

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

____

____

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

____

____

Modifications:

____

Was injured using required equipment?:

____

____

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

____

____

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

____

____

____

____

____

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed	SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature	Title
Signature	Title
Signature	Title

ACCIDENT/INCIDENT FOLLOW-UP: Date: ______________________

Outcome of accident/incident: ______________________

____

____

____

Physician's recommendations: ______________________

____

____

____

Date injured returned to work: ______________________

Follow-up performed by:

Signature	Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

APPENDIX C

EMERGENCY HAND SIGNALS

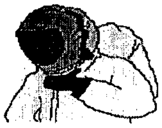
EMERGENCY SIGNALS

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

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

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATH!



Hand gripping throat

LEAVE AREA IMMEDIATELY, NO DEBATE!

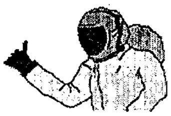
(No Picture) Grip partner's wrist or place both hands around waist

NEED ASSISTANCE!

Hands on top of head

OKAY! – I'M ALL RIGHT!

- I UNDERSTAND!



Thumbs up

NO! - NEGATIVE!

Thumbs down