FINAL

SOIL VAPOR INTRUSION EVALUATION WORK PLAN

ARBA DRY CLEANERS
LEVITTOWN, NEW YORK

WORK ASSIGNMENT NO. D003826-33

SITE NO. 1-30-062

Submitted to:

New York State Department of Environmental Conservation
Albany, New York

Submitted by:

MACTEC Engineering and Consulting, PC
Portland, Maine
MACTEC No. 3612062052

SEPTEMBER 2006

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SEPTEMBER 2006

Submitted by:

John W. Peterson, P.M.
Project Manager

Approved by:

William J. Weber, P.E.
Program Manager

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ACRONYMS

ABB-ES	ABB Environmental Services
DUSR	Data Usability Summary Report
^{o}F	degrees Fahrenheit
HASP	Health and Safety Plan
MACTEC	MACTEC Engineering and Consulting, P.C.
msl	mean sea level
NAPL	Non-Aqueous Phase Liquids
NYCRR	New York Codes, Rules, and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	State of New York Department of Health
PCE	tetrachloroethylene
PID	photoionization detector
PMWP	Project Management Work Plan
ppm	parts per million
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
QAPjP	Quality Assurance Project Plan
QC	Quality Control
ROD	Record of Decision
Site	Arba Dry Cleaners Site
SVIE	Soil Vapor Intrusion Evaluation
SVOC	semi-volatile organic compounds
TAL	Target Analyte List
TCL	Target Compound List
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WA	Work Assignment
WP	Work Plan

1.0 INTRODUCTION

MACTEC Engineering and Consulting, PC (MACTEC), is submitting this Work Plan (WP) to the New York State Department of Environmental Conservation (NYSDEC). This WP addresses the Soil Vapor Intrusion Evaluation (SVIE) at the Arba Dry Cleaners site (Site) in Levittown, Nassau County, New York (Figure 1.1). This WP was prepared in response to Work Assignment (WA) No. D0003826-33 (NYSDEC, 2006), and in accordance with the requirements of the July 1997 Superfund Standby Contract No. D003826 between the NYSDEC and MACTEC.

The SVIE Project Management Work Plan (PMWP), submitted under separate cover, provides cost budgets for Work Assignment (WA) Tasks 1 through 4, including budget estimates for subcontractors and other direct field investigation related costs. The PMWP also provides project organization, staffing plan, and schedule for this WA.

Historical information provided NYSDEC (NYSDEC, 2006) indicate the underlying soil of the building basement and groundwater in the vicinity of the site were contaminated with tetrachloroethylene (PCE) and its degradation products. Remedial efforts were completed and a Record of Decision (ROD) of "No Further Action" was implemented. The Site was de-listed in August 1996 from the New York State Registry of Inactive Hazardous Waste Disposal Sites (NYSDEC, 2006). On behalf of NYSDEC, MACTEC will conduct the SVIE.

This WP represents the culmination of work under Task 1. During Task 1, MACTEC conducted a site inspection to develop information necessary for the technical scope of work and associated field operations/sampling plan for the Site (see Section 3). The WA and ROD are provided in Appendix A, the Quality Assurance Project Plan (QAPjP) is presented in Appendix B, and the site specific Health and Safety Plan (HASP) is presented in Appendix C.

Resources used to prepare this plan include: (1) information provided in the Work Assignment, (2) appropriate guidelines in the NYSDEC Draft DER-10 Guidance (NYSDEC, 2002), (3) results of previous investigations (4) Program Health and Safety Plan (MACTEC, 2005), and (5) Quality Assurance Program Plan (QAPP) (ABB ES, 1995).

2.0 SITE LOCATION AND HISTORY

The Arba Dry Cleaners site is located in a mixed light commercial/residential area at 701 Newbridge Road in Levittown, Nassau County, New York (Figure 1.1). The site is located within a shopping mall consisting of several businesses in a one-story building with a sub level. The area surrounding the building is paved. Presently, Newbridge Kim Cleaners occupies the space previously used by Arba Dry Cleaners. The Site property consists of approximately 1.7 acres.

In April 1988, a fire in the basement of the dry cleaners melted a plastic nozzle of an 80 gallon storage tank containing PCE. The water used to put the fire out mobilized the PCE to a floor drain that discharged to the underlying soils. Remedial action performed at the site included removing contaminated soil, closing the floor drain, refinishing the floor, and monitoring groundwater quality. In April 1995, groundwater and soil (taken from the source area) results indicated that the volatile organics remaining did not pose a threat to human health or the environment. In March 1996, a ROD was developed recommending "No Further Action" for the Site. Lastly, in August 1996, the site was de-listed from the New York State Registry of Inactive Hazardous Waste Disposal Sites (NYSDEC, 2006).

More detailed information pertaining to the site description, history, remediation efforts, and the ROD for this site are included in Appendix A.

On July 11, 2006 MACTEC and the NYSDEC personnel conducted a walkover of the Site area and the building's sub level to discuss the technical scope of the WA. MACTEC personnel documented the walkover with field notes, sketches, and photographs.

3.0 SCOPE OF WORK

A SVIE is necessary at this site to verify remedial efforts undertaken to date are protective of human health. As part of the SVIE, groundwater sampling, gauging, sub-slab soil vapor, and outdoor air sampling have been scoped. Details specific to Groundwater Sampling and Gauging (Task 2), Source Area Investigation (Task 3), and Field Documentation and Reporting (Task 4) are provided in the WA appended to this Work Plan (See Appendix A).

The following sections briefly describe the work elements for the tasks listed above. Figure 3.1 presents the proposed sampling locations and Tables 3.1 and 3.2 summarize the sampling and analytical program. The SVIE will be conducted in accordance with the specifications presented in the QAPP (ABB-ES, 1995) and the site specific QAPjP, included as Appendix B of this Work Plan. Quality Control (QC) and Quality Assurance (QA) procedures for sample handling and sample shipment are presented in Section 5.0 of the QAPP. QA/QC sample frequencies are presented in Section 9.0 of the QAPP. Health and Safety procedures for on site activities are presented in the Program HASP (MACTEC, 2005) and the site specific HASP is included as Appendix C to this Work Plan. Off-site laboratory analyses will be performed by Mitkem, a New York State Department of Health-approved and ELAP-certified laboratory. The Columbia Analytical Services project schedule is provided as Figure 3.2.

3.1 SITE INVESTIGATION

General field activities, including mobilization, health and safety, and decontamination, are described in the following subsections. Upon approval of the PMWP and WP, MACTEC will begin procurement of subcontractors.

Mobilization. Upon receiving the NYSDEC authorization to begin fieldwork, MACTEC and its subcontractors will mobilize to the Site and begin the field program. Mobilization will include obtaining utility clearances, if applicable, and acquisition of the following:

- transportation to and from the Site;
- health and safety clothing and monitoring equipment;
- decontamination supplies and equipment; and
- sampling equipment.

A field team orientation meeting will be held on-site with MACTEC personnel to familiarize field workers with site history, health and safety requirements, equipment calibration procedures, and other field procedures.

Health and Safety. The site specific HASP is provided as Appendix C to this document. Based on available site information, MACTEC anticipates that the field activities will be conducted at Level D personal protection. Specific field investigation activities and required level of personal protection are set forth in the site specific HASP (see Appendix C). Criteria for upgrading or downgrading the specified level of protection are also provided in the site specific HASP. Additional health and safety requirements are set forth in the Program HASP (MACTEC, 2005). Should site conditions pose a threat to those present on-site, and/or should site conditions warrant an upgrade from Level D, as defined by the Site specific HASP, work will stop and the situation will be reevaluated by the NYSDEC and MACTEC.

Decontamination. Sampling methods and equipment for this field program have been chosen to minimize decontamination requirements and minimize possibility of cross contamination. Disposable sampling equipment will be used as much as practical to minimize decontamination time and water disposal. Non disposable sampling equipment will be decontaminated before and after the collection of each sample per Subsection 4.3 of the QAPP and as outlined in the WA (see page 3, Appendix A).

Decontamination fluids will be released on-site to the ground surface in the area of decontamination, so as to allow the liquids to infiltrate into the soil and not run off-site. In the event that decontamination fluids or equipment exhibit visual or olfactory evidence of contamination, fluids will be containerized for offsite disposal.

Investigation Derived Wastes. Purge water from groundwater sampling will be placed and dispersed in the ground unless it exhibits visual or olfactory evidence of contamination, in which case fluids will be containerized for offsite disposal (see page 3, Appendix A).

Personal Protective Equipment. Used disposable equipment and protective clothing will be double bagged in polyethylene trash bags and sealed with twist ties. MACTEC personnel will measure the headspace in the closed bags with a photoionization detector (PID) at least one hour

after sealing the bags. If the headspace reading is greater than 5 parts per million (ppm), the tubing will be decontaminated by flushing with potable water and re-bagged. This process will be repeated until PID readings are below 5 ppm. If the headspace is below 5 ppm, the disposable equipment and clothing will be disposed of as non-hazardous refuse.

3.1.1 Task 2 - Groundwater Sampling and Gauging

During the site visit, four existing monitoring wells (MW-1, MW-2, MW-3 and MW-3D) were located and appeared suitable for sampling. Paving activities were being performed at the time of the site visit in the vicinity of wells MW-2, MW-3, and MW-3D; therefore temporary well modifications were performed (i.e., extend PVC well riser, fill void space surrounding riser with pea gravel, re-seat steel road box cover) to help preserve the well integrity until more permanent measures can be taken, if deemed necessary. MW-1 is located to the north (upgradient) from the shopping mall, and MW-2, MW-3, and MW-3D are located to the south/southwest of the building (see Figure 3.1).

Prior to sampling, water level measurements and the presence/absence of non-aqueous phase liquids (NAPL) will be documented for each well. Groundwater samples will then be collected using low-flow sampling procedures described in Appendix B and analyzed for target compound list (TCL) volatile organic compounds (VOCs) using EPA method 8260 and semivolatile organic compounds (SVOCs) using EPA method 8270, and Target Analyte List (TAL) metals using EPA methods 6010/7470.

3.1.2 Task 3 - Source Area Investigation

Field investigation activities include conducting sub-slab soil vapor survey to determine if elevated concentrations of VOCs are present beneath the sub-level of the dry cleaner facility. Per the WA in Appendix A, two sub-slab samples will be collected from beneath the concrete basement floor of the lowest level of the existing dry cleaners space. During the site visit, the location of the excavation activities associated with the remedial action was not determined due to a uniform coating that was applied to the surface of the concrete floor. The sample points shall be situated appropriately within the basement of the dry cleaning facility to provide similar coverage area, easy access/work space, and away from cracks in the concrete. One outdoor air sample upwind of the building is also planned.

Soil vapor and outdoor air samples will collected using the "Sub-Slab Soil Vapor Sample Collection" and "Outdoor Air Sample Collection" procedures described in the WA (see pages 4 and 5, Appendix A) as well as Section 2.7.2 and Figure 2.3 of the State of New York Department of Health (NYSDOH) soil vapor intrusion guidance (see Appendix A). Samples will be analyzed for VOCs using EPA method TO-15. The sub-slab locations will be backfilled and finished with cement (or other suitable material) to match the existing floor surface.

While conducting sub-slab soil vapor sampling, the following will be performed:

- Measure PID readings before and after sampling.
- Construct sample points as directed in WA (see Appendix A).
- A minimum of two implant volumes and a maximum of three implant volumes shall be purged from each sampling point prior to collecting soil gas samples (less than 200 ml/min) using a syringe. Discharge syringe contents outside.
- Field duplicate pair will be collected by connecting a second canister before purging by installing a ¼ inch stainless steel "tee" fitting between the probe discharge tubing and the stainless steel valve.
- Sample at a rate less than 200ml/min for at least 20 minutes.
- Confirm sample was collected at an appropriate rate by monitoring gage pressure accordingly.
- Field notes will include any observations during installation and purging of sub-slab points (e.g., no vacuum present after purging or vacuum present after purging).
- The PID measurement, regulator ID, and SUMMA® ID will be included on the Chain of Custody Record.

3.1.3 Site Survey

A site map will be developed showing general site features (i.e., buildings, roadways, fences, etc.) within the vicinity of the site. Locations of all sample points and existing monitoring wells will be surveyed. Horizontal positions will be tied to North American Datum 1983 and UTM Zone 18N coordinate system. Monitoring well elevations will be determined using nearby benchmarks, if available (NAVD 88) or assumed datum if benchmarks are not available.

3.2 SVIE DATA SUMMARY REPORT

Upon completion of field program and receipt of analytical data, MACTEC will initiate Task 4, preparation of the SVIE Data Summary Report.

The SVIE Data Summary Report will document the field activities completed, include a Site plan depicting the groundwater elevation contours, and provide results of the laboratory analysis. Copies of log book pages, sampling forms, field data records, field instrument calibration records, photos of sampling locations, sampling data, and a Data Usability Summary Report (DUSR) will be included as appendices to the Data Summary Report. The DUSR will be prepared by a qualified, independent third party validation subcontractor.

Analytical results will be compared to the appropriate published health standard or guidelines, as indicated below. Reported concentrations of individual analytes observed in excess of the standards or guidelines will be noted in the report. Groundwater analytical results will be compared to the New York State (NYS) Class GA Groundwater Quality Standards 6 New York Codes, Rules, and Regulations (NYCRR) Parts 700-705 (NYS, 1999b). The soil vapor and outdoor air sample results will be compared to the NYSDOH guidelines for organic compounds (NYSDOH, 2005).

The information provided in the Data Summary Report will assist the NYSDEC in determining whether the site continues to meet the State's definition of a de-listed hazardous waste site or if the site poses a potential threat to public health from the vapor intrusion pathway.

Three copies of the Draft SVIE Data Summary Report will be sent to the NYSDEC Project Manager and NYSDOH for review and comment. Up to six hard copies of the Final SVIE Data Summary Report and one electronic (PDF) version will be submitted to the NYSDEC project manager. The Final report will incorporate the NYSDEC and NYSDOH review comments. The NYSDEC will be responsible for forwarding copies of the report to other state and county agencies, other than the NYSDOH. An Electronic Data Deliverable will also be provided as specified in the WA.

4.0 REFERENCES

ABB Environmental Services, 1994. Program Quality Assurance Program Plan. Prepared for the New York State Department of Environmental Conservation, Albany, New York. June 1994.

MACTEC Engineering and Consulting, Inc. P.C., 2005. *Program Health and Safety Plan*. Prepared for New York State Department of Environmental Conservation, Albany, New York. 2005.

New York State (NYS), 1999b. New York Codes, Rules, and Regulations, Title 6, Part 700-705 Water Quality Regulations Surface Water and Groundwater Classifications and Standards. Amended August 1999.

New York State Department of Environmental Conservation (NYSDEC), 2006. Work Assignment #D003826-33, Arba Dry Cleaners, Site # 1-30-062 - letter dated June 7, 2006.

New York State Department of Environmental Conservation (NYSDEC), 2002. Draft DER-10, Technical Guidance for Site Investigation and Remediation. December 2002.

New York State Department of Health (NYSDOH), 2005. *"Guidance for Evaluating Soil Vapor Intrusion in the State of New York"*, Public Comment Draft, February 2005.

TABLES

TABLE 3.1
PROPOSED FIELD TASKS AND METHODOLOGY

Arba Dry Cleaners, Site # 1-30-062
Work Assignment #D003826-33

	Exploration ID	Location	Termination Criteria	Sample Determination	Rationale	Analytical
Existing On-site Monitoring Wells	GW-MW1, GW-MW2, GW-MW3, GW-MW3D	Groundwater sample collected from four existing on-Site wells.	Approx 35 to 40 feet bgs. MW-3D likely screened in Magothy aquifer (approx 150 feet bgs).	Sample collected from presumed upgradient monitoring well (MW-1) and three downgradient monitoring wells (MW-2, MW-3, MW-3D).	To characterize groundwater conditions in the vicinity of the site.	TCL VOCs by EPA 8260 TCL SVOCs by EPA 8270 TAL Metals by EPA 6010/7470
Sub-slab Soil Vapor	SS-1 & SS-2	Beneath dry cleaners basement (situated at approximate locations of source area, easy access/work space, away from cracks in floor).	2 - 3 inches into sub-grade material.	Sample to be collected from locations scoped during site walk over and away from floor penetrations (cracks, floor drains, sumps, etc.).	To assess the potential for soil vapor intrusion into building.	VOCs by USEPA TO-15
Outdoor Air	OA-1	Upwind of dry cleaners, near Levittown Pkwy.	3 to 5 feet above site grade in breathing zone	Sample collected from upwind location of building (preferably located on Levittown Pkwy side of building).	To assess background outdoor air conditions at the site.	VOCs by USEPA TO-15

TABLE 3.2
PROPOSED SAMPLE IDENTIFIACTION AND ANALYSES

Arba Dry Cleaners, Site# 1-30-062
Work Assignment #D003826-30

				Water Samples			Vapor Samples
Site Type	**Media**	**Site ID**	**Sample ID**	**VOCs**	**SVOCs**	**TAL Metals**	**VOCs (TO-15)**
Existing Monitoring Well Sampling							
Well	Water	MW-1	Arba-GW-MW1	1	1	1	
Well	Water	MW-2	Arba-GW-MW2	1	1	1	
Well	Water	MW-3	Arba-GW-MW3	1	1	1	
Well	Water	MW-3D	Arba-GW-MW3D	1	1	1	
Sub-slab Soil Vapor Sampling							
Soil Gas	Vapor	SS-1	Arba-SS-1				1
Soil Gas	Vapor	SS-2	Arba-SS-2				1
Outdoor Air Sampling							
Air	Air	OA-1	Arba-OA-1				1
Quality Control Sampling							
			MSMSD	1	1	1	
			DUP	1			1
			TRIP BLANK	1			
TOTAL PROPOSED SAMPLES				**7**	**5**	**5**	**4**

Notes:

MS/MSD = matrix spike/matrix spike duplicate
DUP = field duplicate
RINSE BLANK = rinseate field blank
VOCs, SVOCs, Pest/PCB, TAL Metals water and soil = Target Compound List / Target Analyte List analyzed by NYSDEC ASP 2000 - OLM04.2 methods for soil and water.
TO-15 = Vapor samples analyzed for VOCs by USEPA Method TO-15.
Refer to section 4.2 (Table 4.1) of QAPP and section 2.3 of QAPjP (Appendix B) for holding times, sample preservation, and container type and volume.

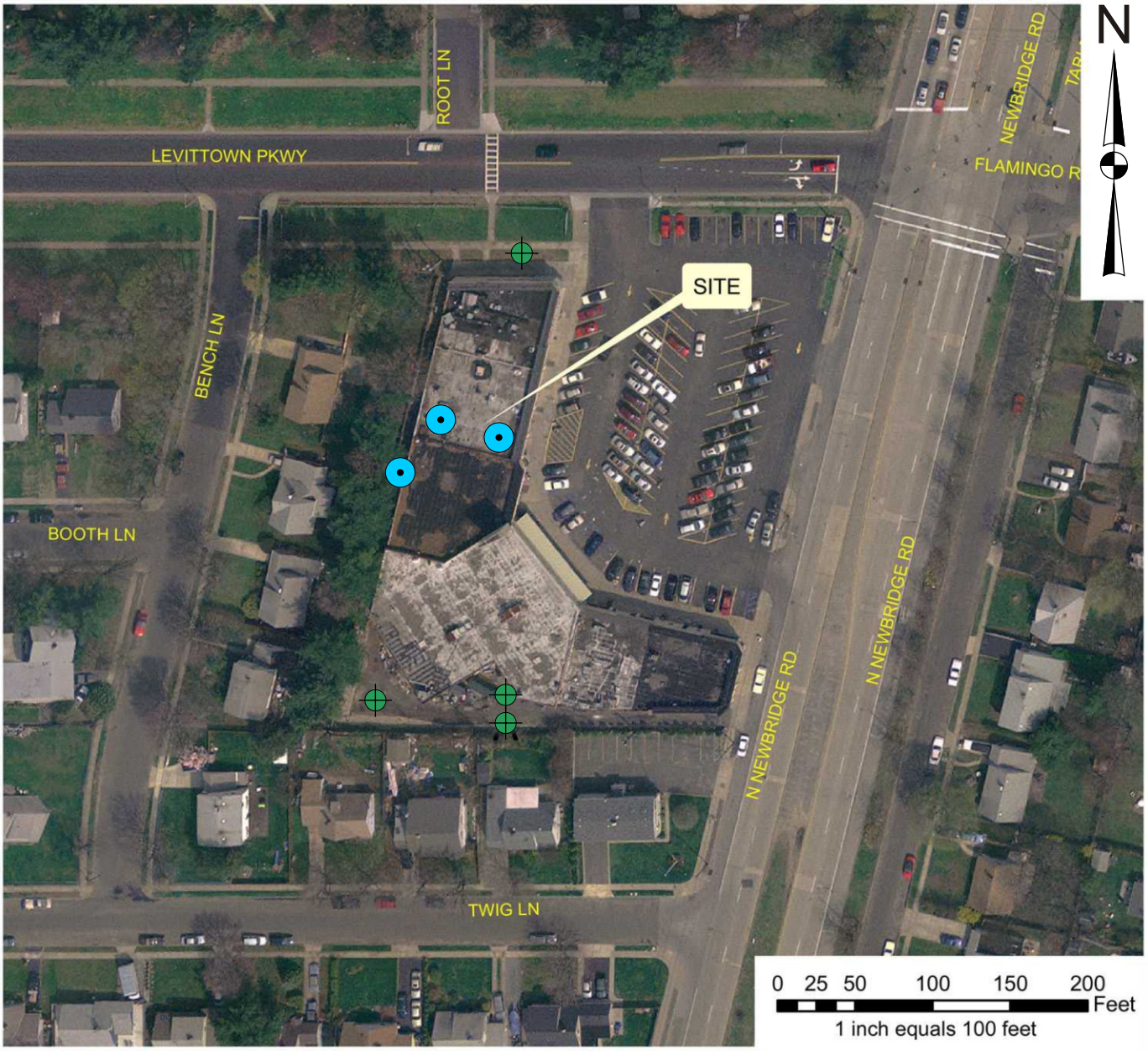
FIGURES

1:24,000 scale USGS Digital Raster Graphic Quadrangle for Hicksville and Freeport NY obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us/

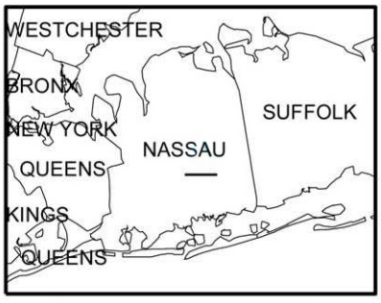
Prepared/Date: BRP 07/07/06
Checked/Date: JPC 07/08/06

NYSDEC Arba Dry Cleaners Site Levittown, NY	MACTEC	Site Location Project 3612062052 Figure 1.1

Document: P:\Projects\NYSDEC1\PROJECTS\Region_1_Dry_Cleaners-ARBA\4.0_Deliverables\4.5_Databases\GIS\Arba_SiteLocation.mxd PDF: P:\Projects\NYSDEC1\PROJECTS\Region_1_Dry_Cleaners-ARBA\4.0_Deliverables\4.2_Work_Plans\Figures\Arba_Fig1.1.pdf 07/07/2006 4:05 PM brpeters



Source Data: Aerial - 2004 Color 20cm Resolution



Key Plan
1 inch equals 20 miles

Legend

- Sampling Point
- Existing Monitoring Wells
  approximate locations

NYSDEC Arba Dry Cleaners Site Levittown, NY	MACTEC	Proposed Sample Locations Project 3612062052 Figure 3.1

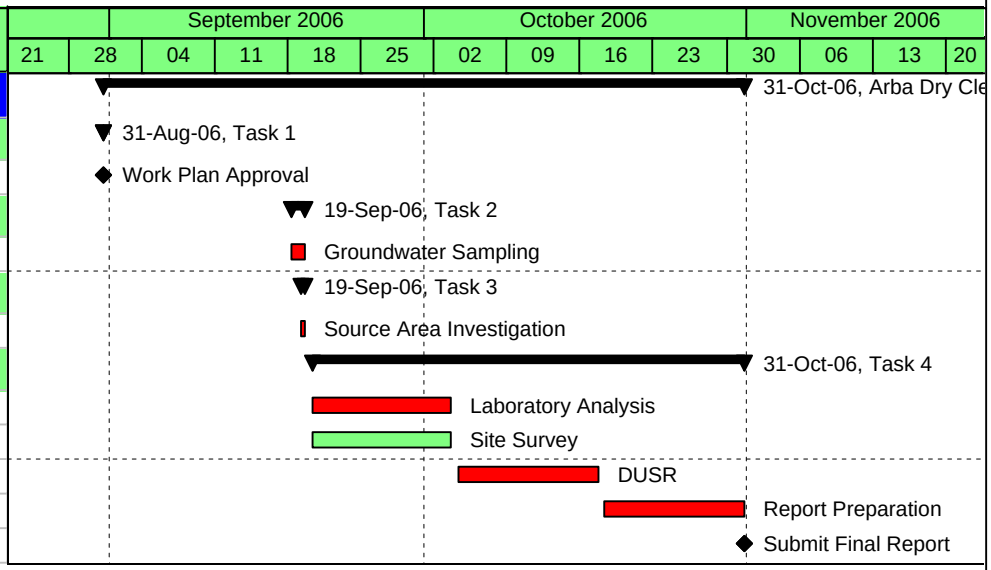
PORT2006031c.cdr

FIGURE 3.2

PROJECT SCHEDULE

ARBA DRY CLEANERS SITE

Activity Name	Original Duration	Start	Finish
Arba Dry Cleaners Site	44	31-Aug-06	31-Oct-06
Task 1	0	31-Aug-06	31-Aug-06
Work Plan Approval	0	31-Aug-06*	
Task 2	2	18-Sep-06	19-Sep-06
Groundwater Sampling	2	18-Sep-06	19-Sep-06
Task 3	1	19-Sep-06	19-Sep-06
Source Area Investigation	1	19-Sep-06	19-Sep-06
Task 4	30	20-Sep-06	31-Oct-06
Laboratory Analysis	10	20-Sep-06	03-Oct-06
Site Survey	10	20-Sep-06	03-Oct-06
DUSR	10	04-Oct-06	17-Oct-06
Report Preparation	10	18-Oct-06	31-Oct-06
Submit Final Report	0		31-Oct-06



Project Schedule - Arba Dry Cleaners Site

Prepared by: DB 02-Aug-06

Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

APPENDIX A

WORK ASSIGNMENT #D003826-33, June 2006
And
RECORD OF DECISION, March 1996

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Program Management, Room 1224
625 Broadway, Albany, New York 12233-7012
Phone: (518) 402-9764 • **FAX:** (518) 402-9722
Website: www.dec.state.ny.us

Denise M. Sheehan
Commissioner

June 7, 2006

Mr. William Weber, P.E.
Program Manager
MACTEC Engineering and Consulting
511 Congress Street, P.O. Box 7050
Portland, Maine 04112-7050

Dear Mr. Weber:

Re: **Work Assignment #D003826-33**
Arba Dry Cleaners, Site #1-30-062
Levittown, Nassau County

Enclosed is a copy of a State Superfund Work Assignment (WA) for the above referenced site. Please acknowledge receipt by returning a signed copy of this letter to me within one week of receipt.

This WA has been identified by an alpha-numeric designation denoting the MACTEC Engineering and Consulting contract number and sequential number of this WA. Although this letter authorizes the expenditure of Work Plan Development Cost funds, these funds will not be available for payment until the Office of the State Comptroller (OSC) encumbers monies for this WA (generally this takes four weeks).

Project Name:	Arba Dry Cleaners
W.A. Number:	D003826-33
Site Numbers:	1-30-062
Operable Unit No.:	N/A
Program Element:	SC/SVIE
NYSDEC Project Manager:	Brian Jankauskas
Phone Number:	(518) 402-9620

Work Plan Development Cost Authorization (Task 1):	$ 2,000
Estimated Work Assignment Budget (Tasks 2-4):	$11,000
Total Estimated Work Assignment Budget (All Tasks):	$13,000

Also enclosed is a copy of the work plan development schedule. All efforts should be made to adhere to it. Final work plans and budgets are to be developed so that a Notice to Proceed can be issued within a maximum of 90 days. Failure to do so may result in termination of this WA and will affect your firm's receipt of future work assignments.

A work plan submitted to the Department should include the following items:

1. **Description of major tasks and subtasks.**

2. **Detailed work assignment progress schedule with milestones.**

3. **Identification of areas of work requiring subcontracting.**

4. **A detailed work assignment budget** broken down by tasks and subtasks (using schedule 2.11 in the contract) in accordance with the contract's budget reporting requirements, utilizing cost rates and factors contained in the base contract (see Article 4 of contract), applied to the approved level-of-efforts. Schedule 2.11(b) must include all labor hours inclusive of administrative labor hours which should be presented separately in Schedule 2.11(b-1).

5. **A staffing plan** identifying management and technical staff and their responsibilities (submit resumes only for unapproved employees).

6. **A final M/WBE Utilization Plan** identifying subcontracts most likely to result in M/WBE utilization to be submitted to this office within two weeks.

If you have any questions concerning contractual procedures, please contact Ms. Lisa Lewis at (518) 402-9601. If you have any questions concerning WA-related technical issues, please contact the New York State Department of Conservation project manager identified in this letter. Please submit five (5) double-sided copies of the Work Plan and all responses on this WA to me.

Sincerely,

Swapan Gupta, P.E.
Acting Chief
Contracts and Payments Section
Bureau of Program Management

Enclosures

Date Received and Accepted:_____

Signature of Consultant:_____

Standby Contract Work Assignment
Type of Contract: Cost Plus Fixed Fee
Project: Soil Vapor Intrusion Evaluation at Arba Dry Cleaners (Site No.:1-30-062)
Levittown, Nassau County, New York
NYSDEC Project Manager: Brian Jankauskas
Phone: (518) 402-9620

SITE LOCATION AND DESCRIPTION:

General/Location

The Arba Dry Cleaners site (herein identified as the "site") is located at 701 Newbridge Road in Levittown, Nassau County, New York. The site is located within a shopping mall, which covers approximately 1.7 acres. The shopping mall consists of multiple businesses that are located within a large single story building with a sub-level. The remainder of the property has been paved. Presently the space previously occupied by Arba Dry Cleaners is currently utilized by Newbridge Kim Cleaners. The general area is developed with small commercial and residential properties.

Operational/Disposal History

Arba Dry Cleaners has been operating the dry cleaner since November 1976. In April 1988 a fire occurred in the basement of the dry cleaning building. The fire melted the plastic nozzle connected to an 80 gallon storage tank containing an unknown quantity of tetrachloroethylene (PCE). Water used to put the fire out mobilized the PCE within the basement and caused the solvent to spill into a basement floor drain that discharged to the underlying soils.

Remedial History

In April 1988 a soil sample was collected underneath the floor drain by the Nassau County Department of Health, the results of the analysis confirmed PCE at a concentration of 12,000,000 parts per billion (ppb). In January 1989, soil samples were collected at one foot and five feet below the floor drain, sample results indicated 158,100 ppb and 17,000 ppb respectively. Subsequent groundwater samples were collected in December 1989 also revealed contamination.

In 1989, interim remedial actions were performed at the site that included closure of the basement drain, removal of soil from the drain area, and refinished the basement floor.

In January 1990, three monitoring wells, identified as MW-1 through MW-3, were sampled. Groundwater PCE concentrations ranged from 26 ppb to 1,800 ppb at MW-1 and MW-3 respectively.

In February and June 1991, six monitoring wells, identified as MW-1 through MW-6, were sampled. Groundwater PCE concentrations ranged from 1 ppb to 860 ppb at MW-6 and MW-4 respectively. MW-6 was screen approximately 40 feet below the water table.

In August of 1992, the site was placed on the New York State Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site.

In March 1992, seven monitoring wells, identified as MW-1 through MW-6 and MW-3D, were sampled. The maximum groundwater concentration of PCE was 140 ppb at MW-4. MW-3D, which was screen in the magothy, indicated a PCE concentration of 1 ppb.

In April 1995, seven monitoring wells, identified as MW-1 through MW-6 and MW-3D, were sampled. The maximum groundwater concentration of PCE was 3.4 ppb at MW-3 and the remaining wells indicated a concentration of PCE of <1 ppb. During the remedial investigation two soil samples were collected from a depth of 15 feet and 19 feet in the vicinity of the source area. The analytical results for the two soil samples did not indicate the presence of contamination.

In March 1996, a Record of Decision based upon the results of the remedial investigations and the interim remedial action was developed that recommended no further action as the remedial alternative for the site. A copy of the Record of Decision is attached as Appendix A.

In August of 1996, the site was de-listed from the New York State Registry of Inactive Hazardous Waste Disposal Sites.

Site Geology and Hydrogeology

Previous reports indicate that subsurface materials at the site consist of sand and gravel.

Based on documented groundwater measurements, the depth to groundwater ranges from 35 to 40 feet below site grade and the groundwater flow direction is towards the south.

PROPOSED SITE ACTIVITIES INCLUDED WITHIN THIS WORK ASSIGNMENT:

The Consultant will be responsible for performing a soil vapor intrusion evaluation at the site and will be required to conduct the following activities:

TASK 1 - Work Plan Development

A meeting shall be held at the site in order to discuss this Work Assignment and the requirements of the Work Plan. Based on the meeting, the Consultant will compile a Work Plan which includes a site specific Health and Safety Plan (HASP), Quality Assurance Project Plan (QAPP), and shall detail the following tasks.

TASK 2 - Groundwater Sampling & Gauging

This work assignment includes budgeting for locating existing monitoring wells and subsequent sampling of groundwater at up to four locations in the vicinity of the site for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and metals. The proposed sample locations are illustrated on Figure 1.

The protocol for this effort shall follow NYSDEC Division of Environmental Remediation Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated December 2002. Preliminary sample results shall be available within two weeks and final results shall be provided within the standard turnaround time (30 days).

Groundwater samples will be collected from up to four existing monitoring wells. The locations and conditions of existing monitoring wells shall be determined. The depth to water in permanent monitoring wells will be gauged and the presence/absence of NAPL shall be documented.

Groundwater samples will be collected from existing monitoring wells after purging a minimum of three well volumes and achieving a turbidity below 50 NTUs via NYSDEC approved methods (in low yield

wells, the sample may be collected after well recharges if purged dry). The groundwater samples will be collected either by a dedicated bailer or an alternative method approved by NYSDEC.

Investigative Derived Waste

Purge water shall be placed and dispersed on the ground unless visible contamination or elevated PID readings are observed. If contamination is present, investigative derived waste (IDW) shall be contained and analyzed to determine the appropriate disposal methods.

Decontamination Procedures

All non-dedicated equipment and tools used to collect samples for chemical analysis will be decontaminated prior to and between each sample interval using an Alconox rinse and potable water rinse prior to reuse. Additional cleaning of the equipment with steam may be needed under some circumstances. Decontamination fluids will be discharged to the ground surface unless a visible sheen or odor is detected either on the equipment or the fluids, at which point the decontamination water will be staged in an appropriate container and disposed of appropriately. At sites with existing water management protocols, those protocols should be followed.

Sample Identification and Laboratory Analysis & Reporting

The following terminology shall be used for sample identification:

Groundwater Samples

SITE ID-GW-MW ID

The associated number for groundwater samples shall correspond with the monitoring well identification.

Groundwater samples will be analyzed for VOC by EPA Method 8260, SVOC by EPA method 8270C, and metals by EPA method 7000. The detection limit for the groundwater samples should be 1 microgram per liter (µg/L).

All samples collected must be validated by a party that is independent of the laboratory which performed the analyses and the consultant which performed the fieldwork. A usability analysis will be conducted by a qualified data validator and a Data Validation/Usability Report will be submitted to the NYSDEC.

Site Survey

The Consultant will develop a site plan depicting general site features (i.e. buildings, roadways, utility poles, fences, addresses, etc.) within the vicinity of the site. The locations of all sample points and existing monitoring wells will be surveyed. The horizontal positions should be tied in to the North American Datum 1983 and UTM Zone 18N coordinate system.

TASK 3 - Source Area Investigation

This work assignment also includes budgeting for collection of sub-slab soil vapors at up to two locations to evaluate the source area. The proposed sample locations are illustrated on Figure 1.

This task shall includes:

- Two sub-slab soil vapor probes for VOC; and
- One out-door air for VOC.

The protocol for this effort shall follow SVI Guidance for soil vapor collection and NYSDEC Division of Environmental Remediation Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated December 2002. Preliminary sample results shall be available within two weeks and final results shall be provided within the standard turnaround time (30 days). The Consultant will be required to conduct the following activities at the site to achieve those objectives:

Sub-Slab Soil Vapor Sample Collection

Two sub-slab soil vapor samples will be collected from beneath the floor of the lowest level (i.e. concrete slab) of the existing dry cleaner building, one centrally-located and one located in the vicinity of the abandoned floor drain. Selected locations shall be away from floor penetrations (i.e. cracks, floor drains, sups, etc.).

After completing the inspection of general site conditions, two boreholes will be advanced through the lowest level floor and approximately two inches into the sub-grade material. A section of 1/4 inch diameter teflon or polyethlyene tubing that is identified as laboratory or food grade will be installed within the borehole. The annular space between the borehole and the sampling tubing will be filled with glass beads and sealed with beeswax at the ground surface. The tubing will be connected to "T" valve which is attached to a pump and a summa canister. A minimum of two borehole volumes will be purged from the subsurface at a flow rate less than 0.2 liters per minute. The purged air shall be screed with a PID and the highest reading observed shall be recorded on the appropriate field form. After the final volume is purge, the "T" valve shall be adjusted to divert sub-slab vapors towards a summa canister. The samples will be collected using a laboratory-certified clean summa canisters with two-hour regulators and a vacuum of 28 inches Hg +/- 2 inches. A vacuum of 5 inches Hg +/- 1 inch must be present when sample collection is terminated.

Upon completion of the sampling, the sample tubing will be removed and the temporary soil vapor probe location will be backfilled and the surface finished with cement or appropriate material to match the existing floor surface. Sample locations shall be located and included on the site survey.

Outdoor Air Sample Collection

One out-door air sample will be collected upwind of the building. The samples will be collected using a laboratory-certified clean summa canisters with two-hour regulators and a vacuum of 28 inches Hg +/- 2 inches. A vacuum of 5 inches Hg +/- 1 inch must be present when sample collection is terminated. A section of teflon or polyethlyene tubing that is identified as laboratory or food grade will be extended from the summa canister to collect the sample from the breathing zone at three to five feet above site grade.

Decontamination Procedures

All non-dedicated equipment and tools used to collect samples for chemical analysis will be decontaminated prior to and between each sample interval using an Alconox rinse and potable water rinse prior to reuse. Additional cleaning of the equipment with steam may be needed under some circumstances. Decontamination fluids will be discharged to the ground surface unless a visible sheen or odor is detected either on the equipment or the fluids, at which point the decontamination water will be staged in an appropriate container and disposed of appropriately. At sites with existing water management protocols, those protocols should be followed.

Sample Identification and Laboratory Analysis & Reporting

The following terminology shall be used for sample identification:

Air Samples

SITE ID-SS-1 and 2 (Sub-Slab)
SITE ID-OA-1 (Out-Door)

All samples shall be analyzed by an ELAP certified laboratory. Air samples will be analyzed for VOC using EPA Method TO-15. The analysis for air samples will achieve detection limits of 1 micrograms per cubic meter ($\mu g/m^3$) for each compound. Air sample results shall be provided in $\mu g/m^3$.

All samples collected must be validated by a party that is independent of the laboratory which performed the analyses and the consultant which performed the fieldwork. A usability analysis will be conducted by a qualified data validator and a Data Validation/Usability Report will be submitted to the NYSDEC.

TASK 4 - Field Documentation & Reporting

Field Documentation Procedures

Field notebooks will be used during all on-site work. A dedicated field notebook will be maintained by the field technician overseeing the site activities. In addition to the notebook, any and all original sampling forms, and purge forms used during the field activities, shall be submitted to the NYSDEC as part of the final report. Field and sampling procedures, including sub-slab points, existing monitoring wells, etc., should be photo-documented.

Reporting

A total of three copies of a draft letter report will be submitted that documents the work conducted and presents the results of the sample analysis for review and comment by NYSDEC and NYSDOH. Upon receipt of the comments, the consultant shall revise the draft letter report and print the requested number of final copies indicated in the comment letter. One copy of the final letter report; text, tables, maps, photos, etc., will be submitted as a single pdf file. All electronic files should be submitted to NYSDEC on a compact disc. The site investigation data shall be submitted in the most recent version of the NYSDEC Electronic Data Deliverable (EDD) with the final report submission. Currently this is the USEPA Region 2 EDD dated December 2003.

Estimated Budget and Level of Effort (LOE) Summary

Arba Dry Cleaners Site

Levittown, New York

Site No. 1-30-062

Task Items	Description/Cost	Dollars
1	Work Plan Development	$2,000
2	Groundwater Sampling & Gauging	$5,000
3	Source Area Investigation	$3,000
4	Field Documentation & Reporting	$3,000
	Total Estimate Budget (Tasks 1 - 4)	**$13,000**

Tentative Project Schedule

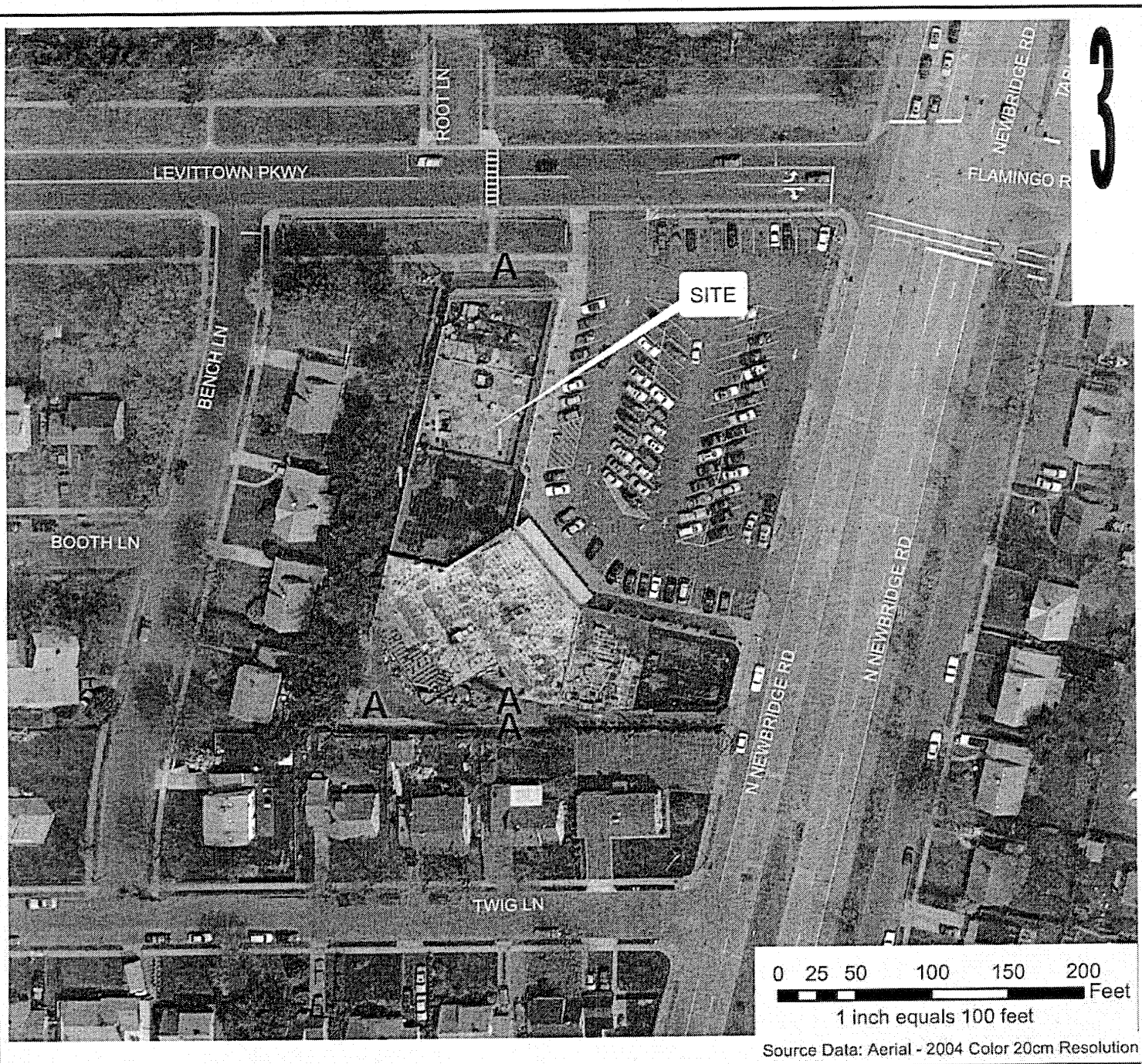
Arba Dry Cleaners Site

Levittown, New York

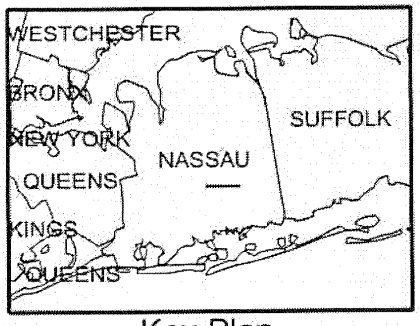
Site No. 1-30-062

Project Milestone	Date
Issue Work Assignment (WA)	June 9, 2006
Acknowledge Receipt of WA	5 Days after Issuance
Work plan development session	June 21, 2006
Submit Task 1 (Draft Work Plan) Deliverable	July 7, 2006
Approve Draft Work Plan	10 days after Draft Work Plan Submitted
Submit Task 1 (Final Work Plan) Deliverable	July 26, 2006
Notice to Proceed (NTP)	July 31, 2006
Commence Task 2 Field Work	August 16, 2006
Tasks 2 Field Work Completed	August 17, 2006
Commence Task 3 Field Work	August 17, 2006
Tasks 3 Field Work Completed	August 18, 2006
Task 4 Submit Draft Report	November 1, 2006
Approve Draft Report	30 Days after Draft Report Submitted
Task 4 Submit Final Report	30 Days after Approval of Draft Report

Figure



Source Data: Aerial - 2004 Color 20cm Resolution



Key Plan
1 inch equals 20 miles

Legend

Sampling Point

A Existing Monitoring Wells
approximate locations

Figure 1
Proposed Sample Locations

Created by: Brian Jankauskas
Date: March 17, 2006

Notes: Geology: medium to coarse sand
Hydrogeology: GW detph ~39 ft bgs and flows south

Department of Remediation

New York State Department of Environmental Conservation
Soil Vapor Intrusion Evaluation
Arba Dry Cleaners (1-30-062)
Levittown, Nassau County, New York

Appendix A
Record of Decision

Department of Environmental Conservation

Division of Hazardous Waste Remediation

Arba Dry Cleaners

Site Number 1-30-062
Levittown
Nassau County, New York

Record of Decision

March 1996

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* MICHAEL D. ZAGATA, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Arba Dry Cleaners Inactive Hazardous Waste Site
Levittown, Nassau County, New York
Site No. 1-30-062

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for the Arba Dry Cleaners inactive hazardous waste site which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This record is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Arba Dry Cleaners inactive hazardous waste site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

This site does not present a current or potential threat to public health or the environment.

Description of Selected Remedy

Based upon the results of the Remedial Investigation for the Arba Dry Cleaners site and the criteria identified for evaluation of alternatives, the NYSDEC has selected the No Further Action alternative for this site.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs with the remedy selected for this site as being protective of human health.

Declaration

The selected remedy is protective of human health and the environment, is designed to comply with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective The remedial actions that have already been completed at this site have resulted in the reduction in the toxicity and mobility of the wastes to the extent necessary to prevent future impacts to public health or the environment. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable, and satisfies the preference for remedies that reduce the toxicity, mobility, or volume of the wastes.

3/29/96
Date

Michael J. O'Toole, Jr., Director
Division of Hazardous Waste Remediation

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RECORD OF DECISION

"Arba Dry Cleaners"
Levittown, Nassau County, New York
Site No. 1-30-062
March 1996

SECTION 1: SITE LOCATION AND DESCRIPTION

Arba Dry Cleaners is located at 701 Newbridge Road in Levittown, Long Island, Nassau County, New York. The site is a dry cleaner located in a small shopping mall near the southeast corner of Bench Lane and the Levittown Parkway. Please refer to Figure 1.

SECTION 2: SITE HISTORY

2.1: Operational/Disposal History

Arba Dry Cleaners has been operating as a dry cleaner since November 1, 1976. An unknown quantity of tetrachloroethylene (PCE) from a 80 gallon storage tank was spilled into the basement floor drain in April 1988, as a result of a fire which caused a plastic nozzle on the tank to melt. Water used to put the fire out exacerbated the contamination. Soil samples taken from underneath the drain (4/88 and 1/89) by the Nassau County Department of Health indicated contamination. Subsequent groundwater samples (12/19/89) also revealed contamination. In June of 1990 Geneva Associates (the site owner) presented a report on remedial investigations conducted at the Arba Dry Cleaners site during the previous two years. At that time, there were three (3) groundwater monitoring wells present on or near the site. Additional wells were installed in 1991 and 1992 bringing the total to seven. Please refer to Figure 2 for location of the monitoring wells. In March of 1993 the site was placed on the New York State Registry of Inactive Hazardous Waste Disposal Sites as a class 2 site. The results of groundwater sampling carried out at the site in 1990, 1991 and 1992 are summarized in Table 1.

2.2: Remedial History

Remedial measures undertaken at the site included removal of contaminated material, closure of the basement drain and repaving the basement floor, all undertaken in 1989.

SECTION 3: CURRENT STATUS

In January of 1995 the site owner submitted a workplan for the site, the field work for which was carried out under the NYSDEC's oversight during the week of April 3, 1995. The final report for the investigation was submitted on May 25, 1995.

3.1: Summary of the Remedial Investigation

The purpose of the Remedial Investigation was to define the nature and extent of any contamination resulting from previous activities at the site. The Remedial Investigation was conducted during April 1995. A report entitled Results of Work Plan Implementation Site Code No. 1-30-062, dated May of 1995 was prepared by Geneva Associates describing the field activities and findings of the Remedial Investigation in detail. A summary of the Remedial Investigation follows:

The Remedial Investigation activities consisted of the following:

- *The integrity of the seven monitoring wells present at or near the site was checked. Each of the wells was found to be functioning correctly.*
- *The location and elevations of all wells were surveyed and located on a drawing.*
- *Groundwater samples were collected from the seven monitoring wells.*
- *Soil samples were taken from the vicinity of the basement drain.*
- *A search of the vicinity of the site was conducted to identify and locate private drinking water wells. No wells were found.*
- *Soil and groundwater samples were analyzed for volatile organic compounds.*

The analytical data obtained from the Remedial Investigation was compared to applicable Standards, Criteria, and Guidance (SCGs) in determining remedial alternatives. Groundwater, drinking water and surface water SCGs identified for the Arba Dry Cleaners site were based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of the NYS Sanitary Code. For the evaluation and interpretation of soil and sediment analytical results, NYSDEC soil cleanup guidelines for the protection of groundwater, background conditions, site conditions, site history, and risk-based remediation criteria were used to develop remediation goals for soil.

The only volatile organic compound (VOC) contamination found in the groundwater wells at Arba Dry Cleaners during the April 1995 sampling was 3.4 ppb of tetrachloroethylene (in Monitoring Well MW-3) and 1,1 dichloroethene, which was found at levels of 2 ppb in well 3D.

The results of the April 6, 1995 groundwater sampling are summarized in Table 1.

The soil samples were all free of VOC contamination. Only methylene chloride was found in the trip blank and the equipment blank, attributable to laboratory contamination.

The soil samples obtained for laboratory analysis in January of 1989, at depths ranging from one to five feet, exhibited levels of tetrachloroethylene ranging from 158 ppm at the one-foot depth to 17 ppm at a depth of 5 feet. However, during the recent testing, in April 1995 none of the soil samples exhibited any degree of contamination at the surface or in the soil samples obtained at depths of 15 and 19 feet (soils in the 1 to 5 foot range were removed). It is postulated that the surface contamination identified in 1989 was removed during the very limited degree of cleanup that occurred when the floor in the basement was repaved and the drain closed, and any remaining contamination has dissipated due to volatilization.

The contamination previously measured in the groundwater has dispersed into the substantial groundwater flow that exists in the area of the subject property.

3.1.1 Nature of Contamination:

The contamination at the site consisted of an unknown quantity (presumably eighty (80) gallons or less) of tetrachloroethylene, spilled into a drain located in the basement of the subject property.

3.2 Interim Remedial Measures:

Interim remedial measures undertaken at the

site include closure of the basement drain removal of soil from the drain area and repaving the basement floor, undertaken in 1989.

3.3 Summary of Human Exposure Pathways:

The primary pathway for human exposure for of this site is through ingestion of groundwater. Based on the results of the remedial investigation in comparison to the SCGs and public health and environmental exposure rates, the site does not present a significant threat to human health.

3.4 Summary of Environmental Exposure Pathways

Based on the results of the remedial investigation, the site no longer constitutes a threat to the environment.

SECTION 4: ENFORCEMENT STATUS

The NYSDEC and Geneva Associates (the site owner) entered into a Consent Order on March 24, 1995, index # 1-W1-0706-94-08. The Order obligates the responsible party to implement a RI/FS. The above order is the only order on record between the NYSDEC and Geneva Associates.

SECTION 5: COMMUNITY ASSESSMENT

Concerns of the community regarding the PRAP were evaluated. A responsive summary describing these concerns and detailing how the Department addressed or will address these concerns is attached as Appendix A. The selected remedy is identical to the one contained in the PRAP and presented at the public meeting that was held on March 14, 1996.

SECTION 6: SUMMARY OF THE REMEDIAL GOALS AND SELECTED ACTION

The selected remedy for any site should, at a minimum, eliminate or mitigate all significant threats to the public health or the environment presented by the hazardous waste present at the site. The State believes that the remediation now in place, which is described in section 3.2, has accomplished this objective.

Based upon the results of the RI and previous investigations that have been performed at the site, the NYSDEC is selecting no further action as the remedial alternative for the site. The NYSDEC has published its proposal to delist the site from the New York State Registry of Inactive Hazardous Waste Sites in the March 13, 1996 Environmental Notice Bulletin (ENB). The ENB notice provides a comment period from March 13 to May 13, 1996. If, during the comment period, comments requiring the Department to reconsider its delisting position are not received, the Department will also delist the site from the New York State Registry of Inactive Hazardous Waste Sites.

ARBA DRY CLEANERS
SITE ID: 1-30-062

TABLE 1

Groundwater Sampling Results

Tetrachloroethene (ppb)

	01/16/90	02/13/91	06/07/91	03/10/92	04/06/95
MW-1	26	<1	<1	<1	<1
MW-2	160	16	3	<1	<1
MW-3	1,800	12	25	23	3.4
MW-4	<1	860	670	140	<1
MW-5	<1	130	70	9	<1
MW-6	<1	5	1	1	<1
MW-3D	<1	<1	<1	<1	<1

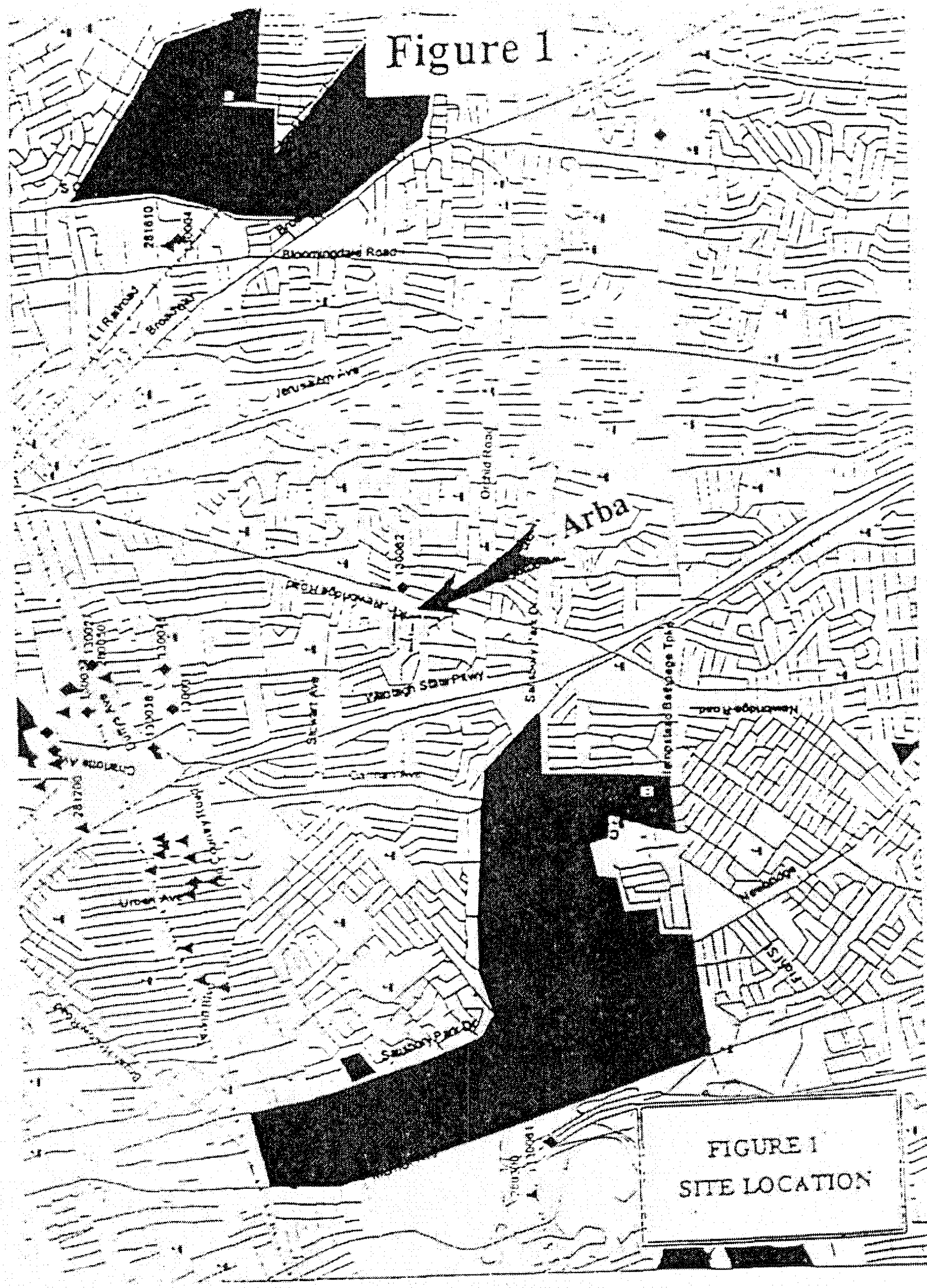
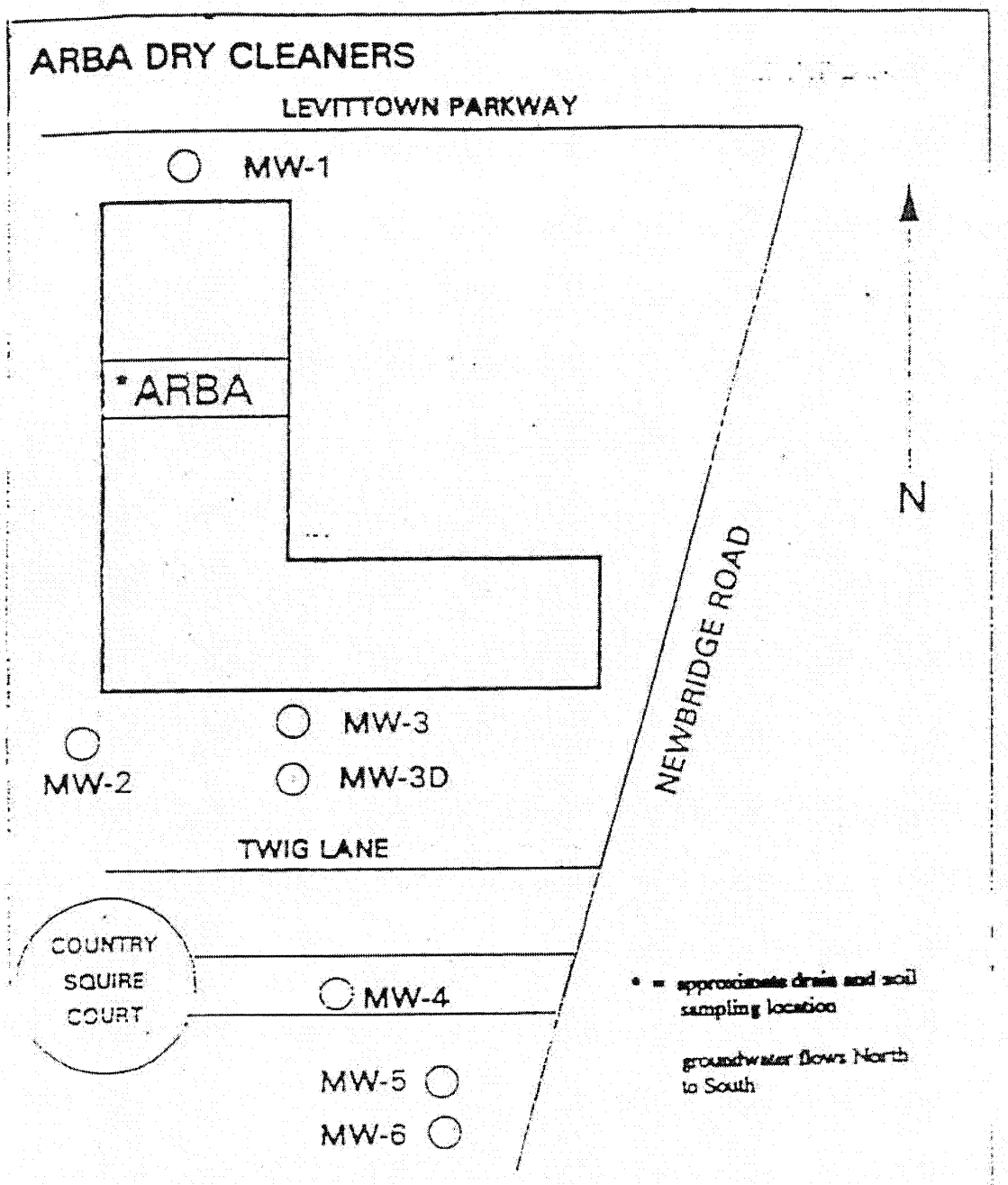


Figure 1
Bloomingdale Road
Jerusalem Ave
Orchid Road
Arba
Newbridge Road
Stewart Ave
Urban Ave
Salisbury Park Dr
FIGURE 1
SITE LOCATION



SCHEMATIC LOCATION OF MONITORING WELLS

Figure 2

APPENDIX A

Responsiveness Summary
Arba Dry Cleaners
Site No. 1-30-062

This document summarizes the comments and questions received by the New York State Department of Environmental Conservation (NYSDEC) regarding the Proposed Remedial Action Plan (PRAP) for the subject site. A public comment period was held between February 24 and March 25, 1996 to receive comments on the proposal. A public meeting was also held on March 14, 1996 in the Levittown Hall Auditorium to present the results of the investigation and to present the PRAP.

This Responsiveness Summary is comprised of verbal comments and questions obtained during the March 14, 1996 meeting and comments received by telephone during the comment period. NYSDEC did not receive any written comments.

The following comments and questions are taken directly or paraphrased from the meeting.

1C. The public was never officially notified about the problems and remedial activities at Arba Dry Cleaners until this meeting. Why not? What steps have been taken since 1988 to streamline this process?

R. The initial remedial response was carried out under the supervision of the Nassau County Department of Health. This response included the removal of contaminated soils from the drain area, and the installation of groundwater monitoring wells. The site was placed on the New York State Registry of Inactive Hazardous Waste Disposal sites in March of 1993. Normally, the DEC would have mailed a public notice or held a public meeting immediately after the field investigation conducted in 1995. Since the field investigation did not discover significant soil or groundwater contamination, it was decided to hold a combined meeting to present both the investigation results and the proposed remedy.

2C. Drums were stored behind Arba Dry Cleaners during the late 1980s and early 1990s. What was contained in these drums? If the drums leaked, would there have been a threat to human health?

R. It is our understanding that the drums contained soils and groundwater from the drilling of the monitoring wells at the site. The threat to human health would be minimal as long as no one ingested or came into prolonged contact with the waste. The drums were removed from the property in January 1995.

3C. Could area residents have been exposed to toxic fumes?

R. Pertaining to the tetrachloroethylene (PCE) spill which occurred in 1988, the solvent was spilled onto the basement floor of the dry cleaning facility and was washed down a floor drain by the water used to put out the fire. The solvent spill itself did not have a toxic release to any other area except that of the dry cleaning store above the basement. Due to the location of the spill, it is highly unlikely that residents were exposed to PCE vapors.

It is also highly unlikely that residents to the west of the site could be exposed to soil gas contaminated with PCE. PCE is heavier than water and will readily sink. The groundwater flow in the area is to the south southeast, carrying contamination away from these homes. The soil contamination was concentrated around the floor drain, which has been removed along with the contaminated soil near the drain. The diameter of the spill, measured by the PRP's consultant, was less than two feet. Therefore, it is highly unlikely that nearby homes (which are at least 40 feet away) would be contaminated with soil gas.

4C. Are air emissions from dry-cleaners regulated?

R. The current regulations 6NYCRR part 232 limit the amounts of PCE allowed to be released to the air to a level of 100 ppm.

5C. Could PCE have migrated to the west through the groundwater and affected the properties immediately behind the fence separating Arba Dry Cleaners from the nearby residences?

R. Groundwater flow is generally to the south southeast in the area in question. Therefore, given the small amount of PCE spilled, it is unlikely that any contaminant would have migrated in the direction of these properties. Further, PCE is heavier than water, and would not return to the surface even if it were to migrate through the groundwater in the direction of these houses.

6C. Several trees in the area are dying. Could this be caused by PCE contamination from Arba Dry Cleaners?

R. Contaminant concentrations found downgradient of Arba Dry Cleaners would not be a threat to plant life. Groundwater in this location is at a depth of approximately fifty feet, beyond the reach of most tree roots.

7C. Please do not delist the site. Monitoring of the site should continue.

APPENDIX B

Arba Dry Cleaners
1-30-062

1. Consent Order #1-W1-0706-94-08, New York State Department of Environmental Conservation.

2. Soils and Groundwater Investigation, Arba Dry Cleaners, Richard D. Galli, P.E., P.L., February, 1989.

3. Supplemental Work Plan, Arba Dry Cleaners, Energy and Environmental Analysts, Inc. January 1995.

4. Results of Work Plan Implementation, Arba Dry Cleaners, Energy and Environmental Analysts, Inc., May 1995.

Guidance for Evaluating Soil Vapor Intrusion in the State of New York

PUBLIC COMMENT DRAFT
February 2005

Prepared by:

NEW YORK STATE DEPARTMENT OF HEALTH
Center for Environmental Health
Bureau of Environmental Exposure Investigation

minimize losses of volatile chemicals that are susceptible to photodegradation), meets the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and is certified clean by the laboratory;

d. sample size depends upon the volume of sample required to achieve minimum reporting limit requirements [Section 2.9]; and
e. a tracer gas (e.g., helium, butane, or sulfur hexafluoride) must be used when collecting soil vapor samples to verify that adequate sampling techniques are being implemented (i.e., to verify infiltration of outdoor air is not occurring) [Section 2.7.5]. Once verified, continued use of the tracer gas may be reconsidered.

When soil vapor samples are collected, the following actions should be taken to document local conditions during sampling that may influence interpretation of the results:

a. if sampling near a commercial or industrial building, uses of volatile chemicals during normal operations of the facility should be identified;
b. outdoor plot sketches should be drawn that include the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor ambient air sample locations (if applicable), and compass orientation (north);
c. weather conditions (e.g., precipitation, outdoor temperature, barometric pressure, wind speed and direction) should be noted for the past 24 to 48 hours; and
d. any pertinent observations should be recorded, such as odors and readings from field instrumentation.

The field sampling team must maintain a sample log sheet summarizing the following:

a. sample identification,
b. date and time of sample collection,
c. sampling depth,
d. identity of samplers,
e. sampling methods and devices,
f. purge volumes,
g. volume of soil vapor extracted,
h. if canisters used, the vacuum before and after samples collected,
i. apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and
j. chain of custody protocols and records used to track samples from sampling point to analysis.

2.7.2 Sub-slab vapor

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time. Prior to installation of the sub-slab vapor probe, the building floor should be inspected and any penetrations (cracks, floor drains, utility perforations, sumps, etc.) should be noted and recorded. Probes should be installed at locations where the potential for ambient air infiltration via floor penetrations is minimal.

Sub-slab vapor probe installations [Figure 2.3] may be permanent, semi-permanent or temporary. Sub-slab implants or probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies. The following procedures should be included in any construction protocol:

a. permanent recessed probes must be constructed with brass or stainless steel tubing and fittings;
b. temporary probes must be constructed with polyethylene or Teflon® tubing of laboratory or food grade quality;
c. tubing should not extend further than 2 inches into the sub-slab material;
d. coarse sand or glass beads should be added to cover about 1 inch of the probe tip for permanent installations; and
e. the implant should be sealed to the surface with permagum grout, melted beeswax, putty or other non-VOC-containing and non-shrinking products for temporary installations or cement for permanent installations.

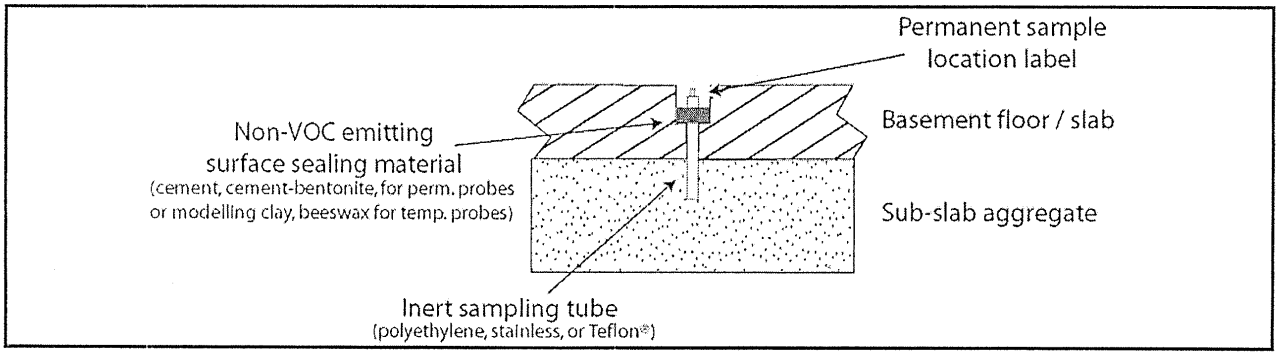


Figure 2.3
Schematic of a sub-slab vapor probe

Sub-slab vapor samples should be collected in the following manner:

a. after installation of the probes, one to three volumes (i.e., the volume of the sample probe and tube) must be purged prior to collecting the samples to ensure samples collected are representative;
b. flow rates for both purging and collecting must not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling; and
c. samples must be collected, using conventional sampling methods, in an appropriate container — one which meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation), meets the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and is certified clean by the laboratory;
d. sample size depends upon the volume of sample required to achieve minimum reporting limit requirements [Section 2.9], the flow rate, and the sampling duration; and
e. ideally, samples should be collected over the same period of time as concurrent indoor and outdoor air samples.

When sub-slab vapor samples are collected, the following actions should be taken to document conditions during sampling and ultimately to aid in the interpretation of the sampling results [Section 3]:

a. if sampling within a commercial or industrial building, uses of volatile chemicals in commercial or industrial processes and/or during building maintenance, should be identified;
b. the use of heating or air conditioning systems during sampling should be noted;
c. floor plan sketches should be drawn that include the floor layout with sample locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system air supply and return registers, compass orientation (north), and any other pertinent information should be completed;
d. if possible, photographs should accompany floor plan sketches;
e. outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sample locations (if applicable), compass orientation (north), footings that create separate foundation sections, and paved areas;
f. weather conditions (e.g., precipitation, indoor and outdoor temperature, and barometric pressure) and ventilation conditions (e.g., heating system active and windows closed) should be reported;
g. smoke tubes or other devices should be used to confirm pressure relationships and air flow patterns, especially between floor levels and between suspected contaminant sources and other areas; and
h. any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppbRAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

The field sampling team must maintain a sample log sheet summarizing the following:

a. sample identification,
b. date and time of sample collection,
c. sampling depth,
d. identity of samplers,
e. sampling methods and devices,
f. soil vapor purge volumes,
g. volume of soil vapor extracted,
h. if canisters used, vacuum of canisters before and after samples collected,
i. apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and
j. chain of custody protocols and records used to track samples from sampling point to analysis.

2.7.3 Indoor air

[Reference: NYSDOH's *Indoor Air Sampling & Analysis Guidance (February 1, 2005)*]

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 - 75 °F) for at least 24 hours prior to and during the scheduled sampling time. If possible, prior to collecting indoor samples, a pre-sampling inspection [Section 2.11.1] should be performed to evaluate the physical layout and conditions of the building being investigated, to identify conditions that may affect or interfere with the proposed sampling, and to prepare the building for sampling. This process is described in Section 2.11.1.

APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN (QAPjP)

QUALITY ASSURANCE PROJECT PLAN
ARBA DRY CLEANERS SITE

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

This Quality Assurance Project Plan (QAPjP) identifies sections of the QAPP (ABB ES, 1994) that apply to the activities described in the site Work Plan, describes variances to those procedures, and specifies the analytical methods used for laboratory analysis of environmental samples.

1.0 GENERAL PROCEDURES AND PRACTICES

The general procedures used to conduct the Site Characterization at the Arba Dry Cleaners site will be taken from the following sections of the QAPP:

Section 2.0	Program Organization and Responsibilities
Section 8.3	Data Reporting
Section 9.0	Internal Quality Control
Section 11.0	Preventive Maintenance
Section 12.0	Data Assessment
Section 13.0	Corrective Action
Section 14.0	Reports to Management

2.0 FIELD PROCEDURES AND SAMPLING

The following field investigation techniques and procedures set forth in the QAPP will be used at the site:

QA/QC Procedures	Section 3.0
Sample Container Requirements and Sample Preservation	Subsection 4.2
Decontamination	Subsection 4.3
Sample Handling	Subsections 4.3 and 5.0
General Water Sampling Methodology	Subsection 4.6.1
Field Instrument Calibration	Section 6.0

The following variances to the above procedures are described in subsections 2.1 to 2.5.

2.1 LOW FLOW OVERBURDEN GROUNDWATER SAMPLING

The following procedure was developed in accordance with the United States Environmental Protection Agency (USEPA) guidance document “Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells”, dated July 30, 1996. This procedure includes a one-saturated well volume volumetric purge requirement to be instituted when monitoring wells that do not have dedicated equipment. Initial insertion of dedicated equipment and non-dedicated sampling equipment commonly causes mixing of the water

column and increases the time frame to achieve stabilized parameters. The volumetric purge requirement is most applicable to lower yielding formations, and should be considered as a good practice to insure sample integrity, although it is not a specific requirement of EPA guidance. A Low Flow Groundwater Sampling Data Sheet will be completed for each monitoring well sample.

BASIC MATERIALS AND EQUIPMENT REQUIRED

- Geopump™ or Bladder Pump with Teflon™ or Teflon™ lined tubing capable of reaching the estimated depth of the well screen;
- Air compressor or compressed gas for bladder pump power supply;
- Water quality unit(s) capable of measuring pH, temperature, specific conductance, dissolved oxygen, redox potential and turbidity;
- Water level meter;
- Photoionization Detector;
- Graduated measuring device and stopwatch;
- Sample bottles and labels;
- Calculator, field data sheets, and logbook; and
- Well construction data.

PROCEDURE

1. Remove well cap and immediately measure VOC concentrations at the well mouth using a PID.

2. If the well casing does not have a reference point [usually an indelible ink mark on the highest rim of the PVC casing], make one, and document it in the field logbook.

3. A static water level measurement will be collected using the top of riser as a reference point. Submersion of the water level meter probe should be minimized within the standing water column to avoid disturbance of colloidal particles.

4. The pump will be lowered into the water column so that the pump intake is located at the mid-point of the saturated screen interval. The pump should be lowered slowly into the water column to minimize the amount of mixing in the well. The discharge line should be secured to minimize movement of the pump during sampling activities.

5. Assemble air lines, bladder pump control box, and in-line water quality monitoring system for bladder pump. Assemble tubing and in-line water quality monitoring system for peristaltic pump. The water quality system should include the following parameters monitored in-line: pH, temperature, specific conductance, redox potential, dissolved oxygen. Turbidity will be monitored separately from those parameters monitored in-line.

6. The depth to water in the well will be re-measured after pump insertion and compared to the initial water level measurement; if the readings vary by greater than 0.5 feet, wait a period of 5 minutes and re-measure the water level and document the measurement before purging is initiated.

7. The initial purging rate should be at the lowest rate obtainable with the pump. The pump start time should be recorded and the flow rate will be measured and recorded using a

graduated measuring device and a stopwatch. Purging rates should not exceed 500 milliliters per minute. During the initial period of pumping, an estimated 5 to 10 minutes, the depth to water in the well should be measured frequently (approximately once per minute) to enable timely pumping rate adjustments in attempts to minimize significant drawdown (i.e., =0.3 feet) in the well. If significant drawdown is observed, pumping rates should be decreased until drawdown is no longer occurring.

8. The initial groundwater sample discharged from the tubing will be monitored for in-line field parameters as described above and documented along with start time a Low Flow Groundwater Sampling Data Sheet.

9. In-line field parameters (as depicted in step 5) and the depth to water will be measured at five minute intervals (initially the water level will be measured more frequently as described in step 7). The data and the associated time will be documented on the Low Flow Groundwater Sampling Data Sheet. Attempts will be made to minimize the drawdown in the well during pumping to less than 0.3 feet, by adjusting the pump flow rate. Drawdown for each well will vary depending on the recharge capacity of the overburden and bedrock units.

10. During pump start-up, drawdown may exceed the 0.3 feet target and recover as flow adjustments are made. Purge volume calculations should include the stabilized drawdown value, not the initial drawdown. Do not allow the water level to fall below the intake of the pump (if the static water level is above the well screen, do not allow the water level to fall below the top of the well screen). The final purge volume must be greater than one saturated screen volume, plus the stabilized drawdown volume, plus the extraction of the tubing volume.

11. Purging requirements are met once at least one saturated screen interval has been removed and when in-line (collected via a flow through cell) water quality readings (three consecutive readings at five minute intervals) meet the following criteria:

    - Turbidity (± 10% for values greater than 5 NTU);
    - Temperature (± 10%);
    - Dissolved Oxygen (±10%);
    - Specific Conductance (±3%);
    - pH (± 0.1 unit); and
    - Redox Potential (± 10 millivolts).

    If the final drawdown measures greater than 0.3 feet, the volume of water drawdown will be calculated and the calculated volume purged in addition to the one saturated screen volume.

    If the above criteria are not achieved, due to excessive drawdown, drawdown below the pump intake or excessive purging (> 1 hours) without stabilization of water quality measurements, alternative sampling procedures can be initiated. Details of reasons why low flow criteria were not obtainable should be clearly documented in the log book and on the sample sheet. The following three options may be implemented, depending on the specific situation.

    a) Continue purging until parameter stabilization is achieved.

b) Discontinue purging activities and do not collect a sample.
c) Discontinue purging and collect samples documenting in the field logs the circumstances surrounding the sample collection.

If, while purging, the recharge rate is less than the lowest pumping rate obtainable with the pump, purge the saturated interval to dryness regardless of the water quality measurements. The well should be sampled as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples (ideally the intake should not be moved during this recovery period). Samples may then be collected regardless of field water quality parameter readings.

12. Following purging procedures, the flow through cell will be disconnected, the flow rate re-adjusted to approximately 100 milliliter per minute (ml/minute). Samples will then be collected directly through the pump/tubing in the appropriate sample bottles.

    VOC samples should be collected first and directly into pre-preserved sample containers. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal disturbance.

    During purging and sampling, the tubing should remain filled with water so as to minimize possible changes in water chemistry upon contact with the atmosphere. If the sampling tube is not completely filled to the sampling point, use one of the following procedures to collect the samples, 1) add a clamp, connector (Teflon or stainless steel) or valve to constrict the discharge end of the tubing; 2) insert a small diameter Teflon tube into the discharge end of the pump tubing, collect samples from the insert tubing. 3) collect non-VOC samples first, then increase the flow rate slightly until the water completely fills the tubing, collect samples and document the new flow rate, water quality readings, and associated drawdown measurements.

    If sample containers are not pre-preserved, add preservatives immediately after sample collection. Check pH value (with pH paper) all preserved samples to ensure proper preservation. Do not check VOC samples or other samples with zero headspace.

    If filtered samples are to be collected, collect samples using the same low flow technique. The filter should be pre-rinsed with 25-50 ml of groundwater prior to sample collection. The flow rate may have to be increased due to restrictions to flow subsequent to filter placement on the discharge line.

    Label each sample with the appropriate sample identification code, sample date, and time of the last sample collected sample time. Samples requiring cooling (i.e., VOCs) will be placed in a cooler immediately after collection and kept at a temperature of 4 degrees Celsius until relinquished to the on-site laboratory or sample manager.

13. The bladder pump will then be removed and decontaminated using the following procedure: flushed with a Liquinox and potable water mixture (approximately 3 gallons), rinsed with potable water (approximately 3 gallons) and rinsed with deionized water (approximately 3 gallons). The peristaltic pump will be removed and tubing decontaminated using the following procedure: flushed with a Liquinox and potable water mixture (approximately 2 gallons), rinsed with potable water (approximately 2 gallons) and rinsed with deionized water (approximately 2 gallons).

REQUIRED DOCUMENTATION

The following items represent the minimum required information to be documented in the field logbooks or field data records. Each individual shall document, in the field logbook, the following appropriate level of detail for each well location prior to setting up on the next exploration location.

- Page number, job number, well ID and date at the top of each page;
- Clock time of all water levels measurements and reference point used;
- Calculation for one purge volume and the total volume purged;
- Clock time purging initiated;
- All purging rate adjustments and clock time adjustment made;
- All in-line water quality readings (i.e., pH, temperature, specific conductance, dissolved oxygen, redox potential, and turbidity);
- Drawdown measurements;
- Analytical parameters collected and associated volumes;
- Assign sample identification code;
- Decontamination of pump;
- Brief description of any problems or occurrences; and
- Time of demobilization.

2.2 INVESTIGATION DERIVED WASTE

Decontamination of equipment will follow procedures described in the QAPP except for disposal of purge water. Well water purged prior to groundwater sampling will be considered contaminated and placed in USDOT-approved 55-gallon containers if visual and olfactory signs of contamination are noted. If no visual and olfactory signs of contamination are noted, water will be considered non-hazardous and will be allowed to infiltrate into the ground surface at the site.

Off-site transport and disposal of IDW-generated wastes (hazardous and non-hazardous) will be the responsibility of MACTEC.

2.3 SAMPLING AND ANALYSIS PROGRAM

Data Quality Objectives (DQOs) for Site sampling activities are summarized in Table B-1. DQOs are described in accordance with USEPA guidelines (USEPA, 1987) and the NYSDEC Analytical Services Protocols (ASP) (NYSDEC, 2000).

Analytical data requirements were established using the methods described in the ASP. Analytical methods to be used for laboratory analysis are presented in Table B-2. Laboratory quantitation limits and associated quality control limits for methods 8260, 8270, 6010/7470, and TO-15 are provided in Attachment 1. Analytical Level B deliverables as described in the ASP will be provided by the laboratory. Data Usability Summary Report (DUSR) will be issued based on DEC guidelines (NYSDEC, 1997).

2.4 SAMPLING IDENTIFICATION

Sample identification will deviate from Subsection 4.1 of the QAPP per sample identification procedures provided in the WA (see pages 3 and 5, Appendix A).

Groundwater samples will be identified as follows:

Arba-GW-MW1
Arba-GW-MW2
Arba-GW-MW3
Arba-GW-MW3D

Air samples will be identified as follows:

Arba-SS-1 (sub-slab location 1 – center of basement)
Arba-SS-2 (sub-slab location 2 – vicinity of drain line)
Arba-OA-1 (outdoor air)

2.5 DRUM LABELING

Drums will be labeled with the following information:

- Drum contents;
- Site name and the NYSDEC Site Number; and
- Date drum filling began and date drum was sealed.

Upon completion of the project, the NYSDEC Project Manager will be notified in writing about the location, number, and any relevant information regarding drums staged on the site. Drums are to be stored on wooden pallets. Drums shall be staged as directed by the NYSDEC. Final off-site transport and disposal of IDW-generated wastes will be the responsibility of MACTEC.

REFERENCE

ABB Environmental Services, 1994. Program Quality Assurance Program Plan. Prepared for the New York State Department of Environmental Conservation, Albany, New York. June 1994.

New York State Department of Environmental Conservation (NYSDEC), 2000. *"Analytical Services Protocols"*; 6/00 Edition; June 2000.

U.S. Environmental Protection Agency (USEPA), 1987. "Data Quality Objectives for Remedial Response Activities"; Office of Emergency and Remedial Response and Office of Waste Programs Enforcement; Washington DC; EPA/540/G-87/003; March 1987.

Table B-1:
Analytical DQO Levels

Parameter	Use	Data Quality Level
PH Temperature Specific Conductance Turbidity	Provides physical and chemical data on groundwater samples for use during sampling collection.	Level I
PID screening	Provides qualitative real-time information on air quality in the breathing zone for health and safety decisions, and to identify potentially contaminated groundwater, soil, and soil gas.	Level I
TCL VOCs & SVOCs, TAL Metals, TO-15 VOCs	Provides analytical information to compare to standards and guidance values.	Level III

Table B-2:
Summary of Analytical Methods

Media	Parameter	Method	Container	Perservative	Holding Time
Groundwater from monitoring well	TCL VOCS	EPA Method 8260	2 (40 mL vial) Teflon-lined septa	Cool, 4°C	7 days
	TCL SVOCs	EPA Method 8270	2 (1 L glass) Teflon-lined lid	Cool, 4°C	5 days extract, 40 days analysis
	TAL Metals	EPA Methods 6010/7470	500 mL (glass or plastic)	HNO_3 to ph<2, 4°C	6 mos. (26 days Hg)
Soil vapor/Outdoor Air	TCL VOCS	USEPA Method TO-15	1.4 L Summa® Canister	None	14d

Notes:
TCL = target compound list
TAL = target analyte list
VOCs = volatile organic compounds
SVOCs = semi volatile organic compounds

ATTACHMENT 1

ANALYTES SORTED BY SERVICE GROUP

SERVICE GROUP: VOA

TEST No.:2412 **TEST NAME:**8260B.TCLL LOW LEVEL TCL VOLATILE ORGANICS

ANALYTE	SYNONYM	WATER PQL	SOIL PQL	WATER REF LOW	WATER REF HIGH	WATER SPK LOW	WATER SPK HIGH	SOIL REF LOW	SOIL REF HIGH	SOIL SPK LOW	SOIL SPK HIGH
(M+P)XYLENE	M+P-XYLENE	1.0	1.0	70	130	70	130	70	130	70	130
1,1,1-TRICHL	1,1,1-TRICHLOROETHANE	1.0	1.0	70	130	70	130	70	130	70	130
1,1,2,2-TETR	1,1,2,2-TETRACHLOROETHANE	1.0	1.0	70	130	70	130	70	130	70	130
1,1,2-TRICHL	1,1,2-TRICHLOROETHANE	1.0	1.0	70	130	70	130	70	130	70	130
1,1-DICLETHA	1,1-DICHLOROETHANE	1.0	1.0	70	130	70	130	70	130	70	130
1,1-DICLETHE	1,1-DICHLOROETHENE	1.0	1.0	70	130	70	130	70	130	70	130
1,2-DICHLORO	1,2-DICHLOROETHANE	1.0	1.0	70	130	70	130	70	130	70	130
1,2-DICLPROP	1,2-DICHLOROPROPANE	1.0	1.0	70	130	70	130	70	130	70	130
2-BUTANONE	2-BUTANONE (MEK)	5.0	5.0	50	150	50	150	50	150	50	150
2-HEXANONE	2-HEXANONE	5.0	5.0	70	130	70	130	70	130	70	130
4-METHYL-2-P	4-METHYL-2-PENTANONE (MIBK)	5.0	5.0	70	130	70	130	70	130	70	130
ACETONE	ACETONE	5.0	10	50	150	50	150	50	150	50	150
BENZENE	BENZENE	1.0	1.0	70	130	70	130	70	130	70	130
BROMODICHLOR	BROMODICHLOROMETHANE	1.0	1.0	70	130	70	130	70	130	70	130
BROMOFORM	BROMOFORM	1.0	1.0	70	130	70	130	70	130	70	130
BROMOMETHANE	BROMOMETHANE	1.0	1.0	50	150	50	150	50	150	50	150
CARBON DISUL	CARBON DISULFIDE	1.0	5.0	70	130	70	130	70	130	70	130
CARBONTETRAC	CARBON TETRACHLORIDE	1.0	1.0	70	130	70	130	70	130	70	130
CHLOROBENZEN	CHLOROBENZENE	1.0	1.0	70	130	70	130	70	130	70	130
CHLOROETHANE	CHLOROETHANE	1.0	1.0	70	130	70	130	70	130	70	130
CHLOROFORM	CHLOROFORM	1.0	1.0	70	130	70	130	70	130	70	130
CHLOROMETHAN	CHLOROMETHANE	1.0	1.0	70	130	70	130	70	130	70	130
CIS-1,2-DICH	CIS-1,2-DICHLOROETHENE	1.0	1.0	70	130	70	130	70	130	70	130
CIS-1,3-DICH	CIS-1,3-DICHLOROPROPENE	1.0	1.0	70	130	70	130	70	130	70	130
DIBROMOCHLOR	DIBROMOCHLOROMETHANE	1.0	1.0	70	130	70	130	70	130	70	130
ETHYLBENZENE	ETHYLBENZENE	1.0	1.0	70	130	70	130	70	130	70	130
METHYLENE CH	METHYLENE CHLORIDE	1.0	1.0	70	130	70	130	70	130	70	130
O-XYLENE	O-XYLENE	1.0	1.0	70	130	70	130	70	130	70	130
STYRENE	STYRENE	1.0	1.0	70	130	70	130	70	130	70	130
SURR2,BFB	4-BROMOFLUOROBENZENE			80	123	80	123	65	129	65	129
SURR3,TOLUEN	TOLUENE-D8			88	124	88	124	75	128	75	128
SURR4,DIBRFL	DIBROMOFLUOROMETHANE			91	115	91	115	62	133	62	133
TETRACHLOROE	TETRACHLOROETHENE	1.0	1.0	70	130	70	130	70	130	70	130
TOLUENE	TOLUENE	1.0	1.0	70	130	70	130	70	130	70	130
TRANS-1,2-DI	TRANS-1,2-DICHLOROETHENE	1.0	1.0	70	130	70	130	70	130	70	130
TRANS-1,3-DI	TRANS-1,3-DICHLOROPROPENE	1.0	1.0	70	130	70	130	70	130	70	130
TRICHLOROETH	TRICHLOROETHENE	1.0	1.0	70	130	70	130	70	130	70	130
VINYL CHLORI	VINYL CHLORIDE	1.0	1.0	70	130	70	130	70	130	70	130

ANALYTES SORTED BY SERVICE GROUP

SERVICE GROUP: VOA

TEST No.:2297 **TEST NAME:**8260B.TCLH TCL VOLATILE ORGANICS

ANALYTE	SYNONYM	WATER PQL	SOIL PQL	WATER REF LOW	WATER REF HIGH	WATER SPK LOW	WATER SPK HIGH	SOIL REF LOW	SOIL REF HIGH	SOIL SPK LOW	SOIL SPK HIGH
(M+P)XYLENE	M+P-XYLENE	5.0	5.0	70	130	70	130	70	130	70	130
1,1,1-TRICHL	1,1,1-TRICHLOROETHANE	5.0	5.0	70	130	70	130	70	130	70	130
1,1,2,2-TETR	1,1,2,2-TETRACHLOROETHANE	5.0	5.0	70	130	70	130	70	130	70	130
1,1,2-TRICHL	1,1,2-TRICHLOROETHANE	5.0	5.0	70	130	70	130	70	130	70	130
1,1-DICLETHA	1,1-DICHLOROETHANE	5.0	5.0	70	130	70	130	70	130	70	130
1,1-DICLETHE	1,1-DICHLOROETHENE	5.0	5.0	70	130	70	130	70	130	70	130
1,2-DICHLORO	1,2-DICHLOROETHANE	5.0	5.0	70	130	70	130	70	130	70	130
1,2-DICLPROP	1,2-DICHLOROPROPANE	5.0	5.0	70	130	70	130	70	130	70	130
2-BUTANONE	2-BUTANONE (MEK)	10	10	50	150	50	150	50	150	50	150
2-HEXANONE	2-HEXANONE	10	10	70	130	70	130	70	130	70	130
4-METHYL-2-P	4-METHYL-2-PENTANONE (MIBK)	10	10	70	130	70	130	70	130	70	130
ACETONE	ACETONE	20	20	50	150	50	150	50	150	50	150
BENZENE	BENZENE	5.0	5.0	70	130	70	130	70	130	70	130
BROMODICHLOR	BROMODICHLOROMETHANE	5.0	5.0	70	130	70	130	70	130	70	130
BROMOFORM	BROMOFORM	5.0	5.0	70	130	70	130	70	130	70	130
BROMOMETHANE	BROMOMETHANE	5.0	5.0	50	150	50	150	50	150	50	150
CARBON DISUL	CARBON DISULFIDE	10	10	70	130	70	130	70	130	70	130
CARBONTETRAC	CARBON TETRACHLORIDE	5.0	5.0	70	130	70	130	70	130	70	130
CHLOROBENZEN	CHLOROBENZENE	5.0	5.0	70	130	70	130	70	130	70	130
CHLOROETHANE	CHLOROETHANE	5.0	5.0	70	130	70	130	70	130	70	130
CHLOROFORM	CHLOROFORM	5.0	5.0	70	130	70	130	70	130	70	130
CHLOROMETHAN	CHLOROMETHANE	5.0	5.0	70	130	70	130	70	130	70	130
CIS-1,2-DICH	CIS-1,2-DICHLOROETHENE	5.0	5.0	70	130	70	130	70	130	70	130
CIS-1,3-DICH	CIS-1,3-DICHLOROPROPENE	5.0	5.0	70	130	70	130	70	130	70	130
DIBROMOCHLOR	DIBROMOCHLOROMETHANE	5.0	5.0	70	130	70	130	70	130	70	130
ETHYLBENZENE	ETHYLBENZENE	5.0	5.0	70	130	70	130	70	130	70	130
METHYLENE CH	METHYLENE CHLORIDE	5.0	5.0	70	130	70	130	70	130	70	130
O-XYLENE	O-XYLENE	5.0	5.0	70	130	70	130	70	130	70	130
STYRENE	STYRENE	5.0	5.0	70	130	70	130	70	130	70	130
SURR2,BFB	4-BROMOFLUOROBENZENE			80	123	80	123	65	129	65	129
SURR3,TOLUEN	TOLUENE-D8			88	124	88	124	75	128	75	128
SURR4,DIBRFL	DIBROMOFLUOROMETHANE			91	115	91	115	62	133	62	133
TETRACHLOROE	TETRACHLOROETHENE	5.0	5.0	70	130	70	130	70	130	70	130
TOLUENE	TOLUENE	5.0	5.0	70	130	70	130	70	130	70	130
TRANS-1,2-DI	TRANS-1,2-DICHLOROETHENE	5.0	5.0	70	130	70	130	70	130	70	130
TRANS-1,3-DI	TRANS-1,3-DICHLOROPROPENE	5.0	5.0	70	130	70	130	70	130	70	130
TRICHLOROETH	TRICHLOROETHENE	5.0	5.0	70	130	70	130	70	130	70	130
VINYL CHLORI	VINYL CHLORIDE	5.0	5.0	70	130	70	130	70	130	70	130

ANALYTES SORTED BY SERVICE GROUP

SERVICE GROUP: EXT

TEST No.:2522 **TEST NAME:**8270C.TCL TCL BASE NEUTRAL/ACID EXTRACTABLES

ANALYTE	SYNONYM	WATER PQL	SOIL PQL	WATER REF LOW	WATER REF HIGH	WATER SPK LOW	WATER SPK HIGH	SOIL REF LOW	SOIL REF HIGH	SOIL SPK LOW	SOIL SPK HIGH
1,2,4-TRICHL	1,2,4-TRICHLOROBENZENE	10	330	17	99	27	104	42	130	34	130
1,2-DICLBENZ	1,2-DICHLOROBENZENE	10	330	23	130	23	130	45	130	45	130
1,3-DICLBENZ	1,3-DICHLOROBENZENE	10	330	17	130	17	130	43	130	43	130
1,4-DICHLORO	1,4-DICHLOROBENZENE	10	330	16	83	23	85	20	112	18	107
2,2'-OXYBIS(	2,2'-OXYBIS(1-CHLOROPROPANE)	10	330	10	140	10	140	10	126	10	126
2,4,5-TRICHL	2,4,5-TRICHLOROPHENOL	10	330	40	110	40	110	34	121	34	121
2,4,6-TRICHL	2,4,6-TRICHLOROPHENOL	10	330	40	110	40	110	33	120	33	120
2,4-DICHLORO	2,4-DICHLOROPHENOL	10	330	66	104	66	104	57	130	57	130
2,4-DIMETHYL	2,4-DIMETHYLPHENOL	10	330	31	92	31	92	45	130	45	130
2,4-DINITROP	2,4-DINITROPHENOL	50	1700	21	123	21	123	23	130	23	130
2,4-DINITROT	2,4-DINITROTOLUENE	10	330	68	113	58	114	46	124	46	124
2,6-DINITROT	2,6-DINITROTOLUENE	10	330	70	130	70	130	62	130	62	130
2-CHLORONAPH	2-CHLORONAPHTHALENE	10	330	52	111	52	111	55	130	55	130
2-CHLOROPHEN	2-CHLOROPHENOL	10	330	16	116	37	105	36	116	18	126
2-METHYLNAPH	2-METHYLNAPHTHALENE	10	330	42	107	42	107	52	130	13	130
2-METHYLPHEN	2-METHYLPHENOL	10	330	16	102	16	102	26	105	26	105
2-NITROANILI	2-NITROANILINE	50	1700	63	130	63	130	51	111	51	111
2-NITROPHENO	2-NITROPHENOL	10	330	63	130	63	130	55	130	55	130
3,3'-DICHLOR	3,3'-DICHLOROBENZIDINE	10	330	48	119	48	119	10	121	10	121
3-NITROANILI	3-NITROANILINE	50	1700	56	111	56	111	10	130	10	130
4,6-DINITRO-	4,6-DINITRO-2-METHYLPHENOL	50	1700	47	130	47	130	38	119	38	119
4-BROMOPHENY	4-BROMOPHENYL-PHENYLETHER	10	330	64	130	64	130	61	113	61	113
4-CHLORO-3-M	4-CHLORO-3-METHYLPHENOL	10	330	21	131	21	131	40	125	28	130
4-CHLOROANIL	4-CHLOROANILINE	10	330	39	107	39	107	10	130	10	130
4-CHLOROPHEN	4-CHLOROPHENYL-PHENYLETHER	10	330	55	106	55	106	60	130	60	130
4-METHYLPHEN	3+4-METHYLPHENOL	10	330	26	99	26	99	22	108	22	108
4-NITROANILI	4-NITROANILINE	50	1700	70	130	70	130	31	105	31	105
4-NITROPHENO	4-NITROPHENOL	50	1700	11	130	10	130	25	132	12	128
ACENAPHTHENE	ACENAPHTHENE	10	330	41	121	41	121	47	123	39	124
ACENAPHTHYLE	ACENAPHTHYLENE	10	330	36	125	36	125	44	124	31	124
ANTHRACENE	ANTHRACENE	10	330	73	130	73	130	44	125	39	122
BENZO(A)ANTH	BENZO(A)ANTHRACENE	10	330	71	130	40	130	48	122	35	129
BENZO(A)PYRE	BENZO(A)PYRENE	10	330	61	119	38	118	49	126	36	130
BENZO(B)FLUO	BENZO(B)FLUORANTHENE	10	330	68	130	39	130	42	128	37	124
BENZO(G,H,I)	BENZO(G,H,I)PERYLENE	10	330	50	125	50	125	42	126	34	129
BENZO(K)FLUO	BENZO(K)FLUORANTHENE	10	330	68	113	41	112	48	124	36	124
BENZYL ALCOH	BENZYL ALCOHOL	10	330	31	109	31	109	38	106	38	106
BIS(-2-CHLOR	BIS(-2-CHLOROETHOXY)METHANE	10	330	61	130	61	130	48	130	48	130
BIS(2-CLETHY	BIS(2-CHLOROETHYL)ETHER	10	330	55	130	55	130	43	130	43	130
BIS(2-ETHYLH	BIS(2-ETHYLHEXYL)PHTHALATE	10	330	70	130	70	130	60	130	60	130
BUTYL BENZYL	BUTYL BENZYL PHTHALATE	10	330	22	141	22	141	56	130	56	130
CARBAZOLE	CARBAZOLE	10	330	70	130	70	130	51	130	51	130
CHRYSENE	CHRYSENE	10	330	61	119	61	119	49	122	32	131
DI-N-BUTYLPH	DI-N-BUTYLPHTHALATE	10	330	46	130	46	130	62	130	62	130
DI-N-OCTYL P	DI-N-OCTYL PHTHALATE	10	330	65	130	65	130	59	130	59	130
DIBENZ(A,H)A	DIBENZO(A,H)ANTHRACENE	10	330	70	130	70	130	23	140	23	140
DIBENZOFURAN	DIBENZOFURAN	10	330	70	130	70	130	42	130	42	130
DIETHYLPHTHA	DIETHYLPHTHALATE	10	330	31	124	31	124	62	130	62	130

ANALYTES SORTED BY SERVICE GROUP

DIMETHYL PHT	DIMETHYL PHTHALATE	10	330	10	121	10	121	61	130	61	130
FLUORANTHENE	FLUORANTHENE	10	330	75	130	62	130	42	124	33	125
FLUORENE	FLUORENE	10	330	60	111	27	113	36	128	33	121
HEXACHLOROBE	HEXACHLOROBENZENE	10	330	58	130	58	130	56	116	56	116
HEXACHLOROBU	HEXACHLOROBUTADIENE	10	330	13	130	13	130	10	104	10	104
HEXACHLOROCY	HEXACHLOROCYCLOPENTADIENE	10	330	10	130	10	130	9	102	9	102
HEXACHLOROET	HEXACHLOROETHANE	10	330	11	130	11	130	10	107	10	107
INDENO(1,2,3	INDENO(1,2,3-CD)PYRENE	10	330	70	130	70	130	41	127	35	129
ISOPHORONE	ISOPHORONE	10	330	58	130	58	130	50	130	50	130
N-NITROSO-DI	N-NITROSO-DI-N-PROPYLAMINE	10	330	25	120	25	120	45	117	34	122
N-NITROSODIM	N-NITROSODIMETHYLAMINE	10	330	27	130	27	130	38	130	38	130
N-NITROSODIP	N-NITROSODIPHENYLAMINE	10	330	70	130	70	130	54	116	54	116
NAPHTHALENE	NAPHTHALENE	10	330	26	109	26	109	38	116	25	120
NITROBENZENE	NITROBENZENE	10	330	49	130	49	130	32	130	32	130
PENTACHLOROP	PENTACHLOROPHENOL	50	1700	16	131	16	131	21	131	13	128
PHENANTHRENE	PHENANTHRENE	10	330	68	130	38	130	48	130	28	130
PHENOL	PHENOL	10	330	10	65	10	71	34	118	26	122
PYRENE	PYRENE	10	330	60	130	52	130	53	130	34	130
SURR1,2-FLUO	2-FLUOROPHENOL			17	74	17	74	10	130	10	130
SURR2,PHENOL	PHENOL-d6			10	69	10	69	10	133	10	133
SURR3,2,4,6-	2,4,6-TRIBROMOPHENOL			41	135	41	135	33	139	33	139
SURR4,NITROB	NITROBENZENE-d5			38	105	38	105	27	130	27	130
SURR5,2-FLUO	2-FLUOROBIPHENYL			38	100	38	100	32	130	32	130
SURR6,TERPHE	TERPHENYL-d14			40	137	40	137	48	131	48	131

Perkin Elmer Optima 5300DV #3
Serial Number: 077N6051602
*** MDL need redigest at lower level**
**** Repeating to increase Linear Range**

Metal	Water PQL (ppb)	Soil PQL (mg/kg)	Water MDL 3005 (06/21/06) (ppb)	Water MDL 3010 (06/21/06) (ppb)	Soil MDL 3050 (07/07/06) (mg/kg)	Linear Range (mg/L) (07/11/06)
AG 328	10	1.00	0.314	0.594	0.0433	5
AL 308	100	10.0	12.0	11.9	8.11	500
AS 188	10	1.00	1.91	2.28	0.207	4
B 249	200	20.0	16.6	16.4	1.51	10
BA 233	20	2.00	2.65 *	2.56 *	0.307 *	40
BE 313	5	0.50	0.119 *	0.119 *	0.0119 *	2
CA 227	1000	100.0	55.6	32.3	12.0	250
CD 226	5	0.50	0.153 *	0.217 *	0.0181 *	2
CO 228	50	5.00	0.586 *	0.602 *	0.0557 *	10
CR 267	10	1.00	0.217 *	0.168 *	0.0257 *	10
CU 324	20	2.00	0.713 *	0.495 *	0.0960 *	5
FE 238	100	10.0	25.9	28.4	1.12	200
K 404	2000	200.0			101	50
MG 279	1000	100.0	11.3 *	15.0 *	1.14 *	500
MN 257	10	1.00	0.168 *	0.217 *	0.0238 *	10
MO 202	25	2.50	0.494 *	0.283 *	0.0527 *	10
NA 330	1000	100.0	173	442	11.7	50
NI 231	40	4.00	0.719 *	0.400 *	0.0238 *	8
PB 220	5	0.50	0.613	0.625	0.114	10
SB 206	60	6.00	6.13 *	11.3 *	0.140 *	10
SE 196	10	1.00	2.53	2.16	0.303	1 **
SN 189	500	50.0	8.86 *	18.6 *	1.39 *	10
SR 460	100	10.0	0.846 *	1.74 *	0.123 *	5
TI 337	50	5.00	0.527 *	0.748 *	0.0586 *	10
TL 191	10	1.00	1.89	2.52	0.251	4
V 292	50	5.00	0.444 *	0.812 *	0.0779 *	10
ZN 206	20	2.00	2.39	0.745	0.201	4

AA IDL's
(UG/L)

Analyte	4100ZL #2 (ppb) [serial # 6245]	4100ZL #1 (ppb) [serial # 6066]	FIMS (ppb)	HYDRA AF GOLD + (ppt)
Pb	0.812 03/14/06	0.895 03/16/06	———	———
As	1.83 03/16/06	———	———	———
Tl	1.00 03/23/06	1.92 03/20/06	———	———
Se	1.05 04/26/06	1.48 03/20/06	———	———
Hg	———	———	0.0125 03/13/06	0.458 06/22/05

Hg Water MDL: 0.0126ug/l (03/14/06)
Hg Soil MDL: 0.00122mg/kg (03/15/06)

Hg 1631 MDL: 0.405ppt (03/31/06)

ug/m3 = ppb * Mw/Mv
Mv = 24.46 at 25C and 760 mmHg
TO-15 Analysis of SUMMA Canisters
Full Scan GC/MS
Compounds listed in Retention time order

Calibration range for 8/22/06 curve

Compound Name	CAS#	MW	MRL at 500ml sample from	====> to	Max at 500 ml sample from	====> to
			PPBv	ug/m3	PPBv	ug/m3
bromochloromethane IS			5.00		5.00	
propylene	115-07-1	42.08	0.49	0.84	19.47	0.67
dichlorodifluoromethane	75-71-8	120.91	0.47	2.31	18.71	1.77
chloromethane	74-87-3	50.49	0.47	0.97	18.71	0.74
freon-114	76-14-2	170.92	0.48	3.34	19.09	2.60
vinyl chloride	75-01-4	62.5	0.48	1.22	19.09	0.95
1,3-butadiene	106-99-0	54.09	0.51	1.12	20.24	0.93
bromomethane	74-83-9	94.9	0.48	1.85	19.09	1.45
chloroethane	75-00-3	64.5	0.48	1.26	19.09	0.98
ethanol (not calibrated)	64-17-5	46.07	0.48	0.91	14.46	0.54
acetone	67-64-1	58.08	0.46	1.10	18.52	0.83
trichlorofluoromethane	75-69-4	137.37	0.46	2.60	18.52	1.97
isopropanol (not calibrated)	67-63-0	60.1	0.49	1.21	19.66	0.97
1,1-dichloroethene	75-35-4	96.94	0.49	1.95	19.66	1.57
methylene chloride	75-09-2	84.93	0.49	1.69	19.47	1.35
freon-113	76-13-1	187.38	0.49	3.77	19.66	3.03
carbon disulfide	75-15-0	76.14	0.49	1.53	19.66	1.23
trans-1,2-dichloroethene	156-60-5	96.94	0.45	1.80	18.14	1.33
1,1-diclethane	75-34-3	98.96	0.50	2.03	20.05	1.66
methyl tert butyl ether	1634-04-4	88.15	0.48	1.74	19.28	1.37
vinyl acetate	108-05-4	86.09	0.53	1.85	21.00	1.59
2-butanone	78-93-3	72.11	0.50	1.46	19.86	1.19
cis-1,2-dichloroethene	156-59-2	96.94	0.50	1.99	20.05	1.63
ethyl acetate	141-78-6	88.11	0.46	1.65	18.33	1.24
hexane	110-54-3	86.18	0.45	1.60	18.14	1.18
chloroform	67-66-3	119.38	0.45	2.21	18.14	1.64
tetrahydrofuran	109-99-9	72.11	0.48	1.42	19.28	1.12
1,4-difluorobenzene			5.00		5.00	
1,2-dichloroethane	107-06-2	98.96	0.51	2.05	20.24	1.69
1,1,1-trichloroethane	71-55-6	133.4	0.51	2.76	20.24	2.28
benzene	71-43-2	78.11	0.51	1.62	20.24	1.34
carbon tetrachloride	56-23-5	153.82	0.50	3.12	19.86	2.53
cyclohexane	110-82-7	84.16	0.47	1.61	18.71	1.23
1,2-diclpropane	78-87-5	112.99	0.50	2.32	20.05	1.90
bromodichloromethane	75-27-4	163.83	0.50	3.32	19.86	2.70
trichloroethene	79-01-6	131.39	0.50	2.67	19.86	2.17
1,4-dioxane (not calibrated)	123-91-1	88.11	0.99	3.58	14.89	2.18
heptane	142-82-5	100.2	0.48	1.96	19.09	1.53
cis-1,3-dichloropropene	10061-01-5	110.97	0.51	2.32	20.43	1.94
4-methyl-2-pentanone	108-10-1	100.16	0.51	2.07	20.24	1.71
trans-1,3-dichloropropene	10061-02-6	110.97	0.48	2.19	19.28	1.72
1,1,2-trichloroethane	79-00-5	133.4	0.51	2.79	20.43	2.33
toluene	108-88-3	92.14	0.51	1.91	20.24	1.58
2-hexanone	591-78-6	100.16	0.51	2.09	20.43	1.75
dibromochloromethane	124-48-1	208.28	0.51	4.31	20.24	3.56
1,2-dibromoethane	106-93-4	187.86	0.50	3.85	20.05	3.16
tetrachloroethene	127-18-4	165.83	0.50	3.40	20.05	2.79
chlorobenzene-d5			5.00		5.00	
chlorobenzene	108-90-7	112.56	0.50	2.31	20.05	1.89
ethylbenzene	100-41-4	106.17	0.50	2.18	20.05	1.78
M+P xylene	1330-20-7	106.17	0.99	4.31	39.71	7.00
bromoform	75-25-2	252.73	0.50	5.13	19.86	4.16
styrene	100-42-5	104.15	0.50	2.13	20.05	1.75
1,1,2,2-tetrachloroethane	79-34-5	167.85	0.50	3.44	20.05	2.82
O xylene	95-47-6	106.17	0.50	2.18	20.05	1.78
surr 1, bromofluorobenzene			5.00		5.00	
4-ethyltoluene	622-96-8	120.19	0.50	2.46	20.05	2.02
1,3,5-trimethylbenzene	108-67-8	120.19	0.50	2.44	19.86	1.98
1,2,4-trimethylbenzene	95-63-6	120.19	0.49	2.42	19.66	1.94
benzyl chloride	100-44-7	126.59	0.49	2.54	19.66	2.04
1,3-dclbenz	541-73-1	147	0.49	2.95	19.66	2.37
1,4-dclbenz	106-46-7	147	0.49	2.93	19.47	2.33
1,2-dclbenz	95-50-1	147	0.49	2.93	19.47	2.33
1,2,4-trichlorobenzene	120-82-1	181.45	0.45	3.36	18.14	2.49
hexachlorobutadiene	87-68-3	260.76	0.47	4.99	18.71	3.81

APPENDIX C

HEALTH AND SAFETY PLAN

MACTEC Engineering and Consulting, PC.

HEALTH AND SAFETY PLAN

The purpose of this HASP is to protect the health and safety of on-site personnel and the surrounding community during the SVIE activities at the Site. This HASP is based on the MACTEC Program HASP (MACTEC, 2005) and consists of a site-specific HASP Addendum to document aspects of the Site.

Prior to initiation of field activities, MACTEC will notify the local fire, police, and potential emergency responders, as deemed necessary, to advise them of the investigation activities that will take place and the schedule of these activities. The Site tenants will also be notified.

In the event of an emergency or corresponding evacuation procedure, evacuation procedures documented in the HASP Addendum will be followed and the emergency contacts notified.

Attachment:

MACTEC Engineering and Consulting
Health and Safety Plan Addendum
(See Program Health and Safety Plan for more details)

Site: **Arba Dry Cleaners** Contact: John Peterson

Street Address: 701 Newbridge Road, Levittown, NY

Proposed Date(s) of Investigation: 9/1/2006 Job Number: 3612062052 Tasks 02 & 03

Prepared by: J. Connolly Date: 7/25/2006

Approved by: Cindy Sundquist Date: 7/26/2006

Proposed Activity(s): Well groundwater sampling and Sub-slab soil vapor sampling (see Soil Vapor Intrusion Evaluation Work Plan).

Known or Suspected Chemicals (include PELs): PCE (TLV- 25 ppm), TCE (TLV=50 ppm), Vinyl Chloride (PEL = 1 ppm).

HAZARD EVALUATION (Check all that apply):

Overall Hazard Estimation:		Serious		Moderate	X	Low		Unknown		None
Major Exposure Route(s):	X	Dermal	X	Inhalation		Ingestion		Puncture		
Contaminant Location(s):		Surface	X	Underground	X	Soil		Sediment	X	Water
		Tank		Other (list):						
Health Hazard(s):		Liquid		Solid		Sludge		Corrosive		Ignitable
	X	Volatile		Radioactive		Reactive		Unknown		
Safety Hazard(s):		Height	X	Equipment		Cold Stress	X	Noise		Eye
		Near Water		Confined Space		Heat Stress	X	Machinery		Burns
	X	Lifting	X	Slips/Falls		Other (list):				

EQUIPMENT (check all that apply): Initial Level of Personal Protection: Modified D

PPE Selected: ***		Cartridge Respirator-See Below	X	Coveralls		Gloves
		Escape Respirator	X	Safety Glasses	X	-inner - vinyl
	X	Safety Boots/Shoes		Face Shield	X	-outer - nitrile
		Chemical Resistant Boots	X	Hard Hat		Tyveks
		Disposable Boot Covers	X	Ear Protection		regular
		Other (list):				coated
Monitoring Equipment:		Combustible Gas/Oxygen Meter		Explosimeter		OVA
		Hydrogen Sulfide Meter	X	Draeger Tubes	X	PID
		Radiation Alert Meter	X	list: vinyl chloride 0.5/a		
		Dosimeter Badge		Other (list):		
Emergency Equipment:	X	First Aid Kit		Fire Extinguisher	X	Eye Wash
		Other (list):				

CONTAMINANT LEVELS FOR MODIFICATION OF PROTECTIVE EQUIPMENT:

Concrete hammer drill: Monitor breathing zone with a 10.6 eV Lamp (10.0 or 10.2 ok too) PID. If PID readings are detected in the breathing zone above background, monitor with a Vinyl Chloride 0.5/a Drager tube. If VC readings are greater than 0.5 ppm, upgrade to Level B PPE. Otherwise, continue working until PID readings reach or exceed 9 ppm. If PID is greater than 9 ppm, upgrade to Level C PPE. VOCs will also be continuously monitored at the perimerter of the designated work zone for each location as a measure of protection for the downwind community. The continuous monitoring will be performed in acordance with NYSDOH gCAMP rev 1 06/00 (see attached).

Significant amounts of dust is not anticipated to be generated during drilling and/or sampling. Dust suppression measures will be used to minimize the generation of dust. In the event that dust conditions do arise, a respirable dust meter will be used to monitor particulates in accordance with NYSDOH gCAMP rev 1 06/00. If particulate levels exceed 100 ug/m^3 above background or greater than 150 ug/m^3, work will be stopped and dust control measures and continuous particulate monitoring will be instituted prior to work being resumed.

GW Sampling and Survey: Monitor breathing zone with a 10.6 eV Lamp (10.0 or 10.2 ok too) PID. If PID readings are detected in the breathing zone above background, monitor with a Vinyl Chloride 0.5/a Drager tube. If VC readings are greater than 0.5 ppm upgrade to Level B PPE. Otherwise, continue working until PID readings reach or exceed 9 ppm. If PID is greater than 9 ppm, upgrade to Level C PPE.

DECONTAMINATION/DISPOSAL: All personnel and/or equipment leaving contaminated sites are subject to decontamination. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination. The decontamination procedures to be used at the site are as follows:
Remove all protective clothing and place PPE in double lined garbage bags. If PID headspace within bag is less than 5ppm, the PPE will be disposed of as municipal waste. Drilling equipment in contact with subsurface soil and water will be cleaned with a pressure sprayer over the boring location. The hole will be filled with concrete to exisitng floor surface.

EMERGENCY MEDICAL TREATMENT/FIRST AID: First aid will be rendered to any person injured on-site, as appropriate. The injured person will then be transported to a medical facility for further examination and/or treatment. An ambulance will be used to transport the injured person to the hospital unless one is not readily available or could result in excessive delay. In this case, other transport is authorized. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

EMERGENCY EVACUATION: In the event of an emergency requiring evacuation, the HSO assumes the role of on-site coordinator. Evacuation responses will occur at three levels: (1) withdraw from the immediate work area (100+ feet upwind); (2) site evacuation; and (3) evacuation of surrounding area. If the residences and commercial operations require evacuation, the local agencies will be notified and assistance requested. Designated on-site personnel will initiate evacuation of the immediate off-site area without delay.

EMERGENCY TELEPHONE NUMBERS:

Local Police Department	911
Local Fire Department	911
Local Rescue Service	911
Primary Hospital: Nassau University Medical Center	(516) 572-0123
Secondary Hospital: New Island Hospital	(516) 579-6000
NYSDEC Spill Hotline	(800) 457-7362
NYSDEC Region 1	(518) 402-9620
Health Resources	(800) 350-4511
National Poison Control Center	(800) 492-2414
Chemical Manufacturing Association-Chemical Referral Center	(800) 262-8200
Cameron O'Connor (NYDOH)	(716) 847-4385
Health and Safety Manager: Cindy Sundquist	(207) 775-5401 (w) (207) 650-7593 (cell)

AUTHORIZED PERSONNEL:

Philip Muller/Tige Cunningham*+

* Current First-aid Certification

\+ Current CPR Certification

FIELD TEAM REVIEW: I have read and reviewed the health and safety information in the HASP. I understand the information and will comply with the requirements of the HASP.

Name:_____ Date:_____
Name:_____ Date:_____
Name:_____ Date:_____
Name:_____ Date:_____
Name:_____ Date:_____
Name:_____ Date:_____

ROUTES TO EMERGENCY MEDICAL FACILITIES

PRIMARY HOSPITAL:

Facility Name: Nassau University Mediacal Center
Address: County St., Hempsted, NY
Telephone Number: (516) 572-0123

DIRECTIONS TO PRIMARY HOSPITAL (attached map):

1. Take a right onto Twig Lane - go 1.3 mi
2. Turn right on Hempstead Tpke (RT-24) - go 0.7 mi
3. Turn right on Carman Ave - go 0.1 mi
4. Make a hard right turn on Perimeter W - go 0.1 mi
5. Turn left on County St - arrive at Nassau University Mediacal Center

Driving distance: 2.2 miles / 4 minutes

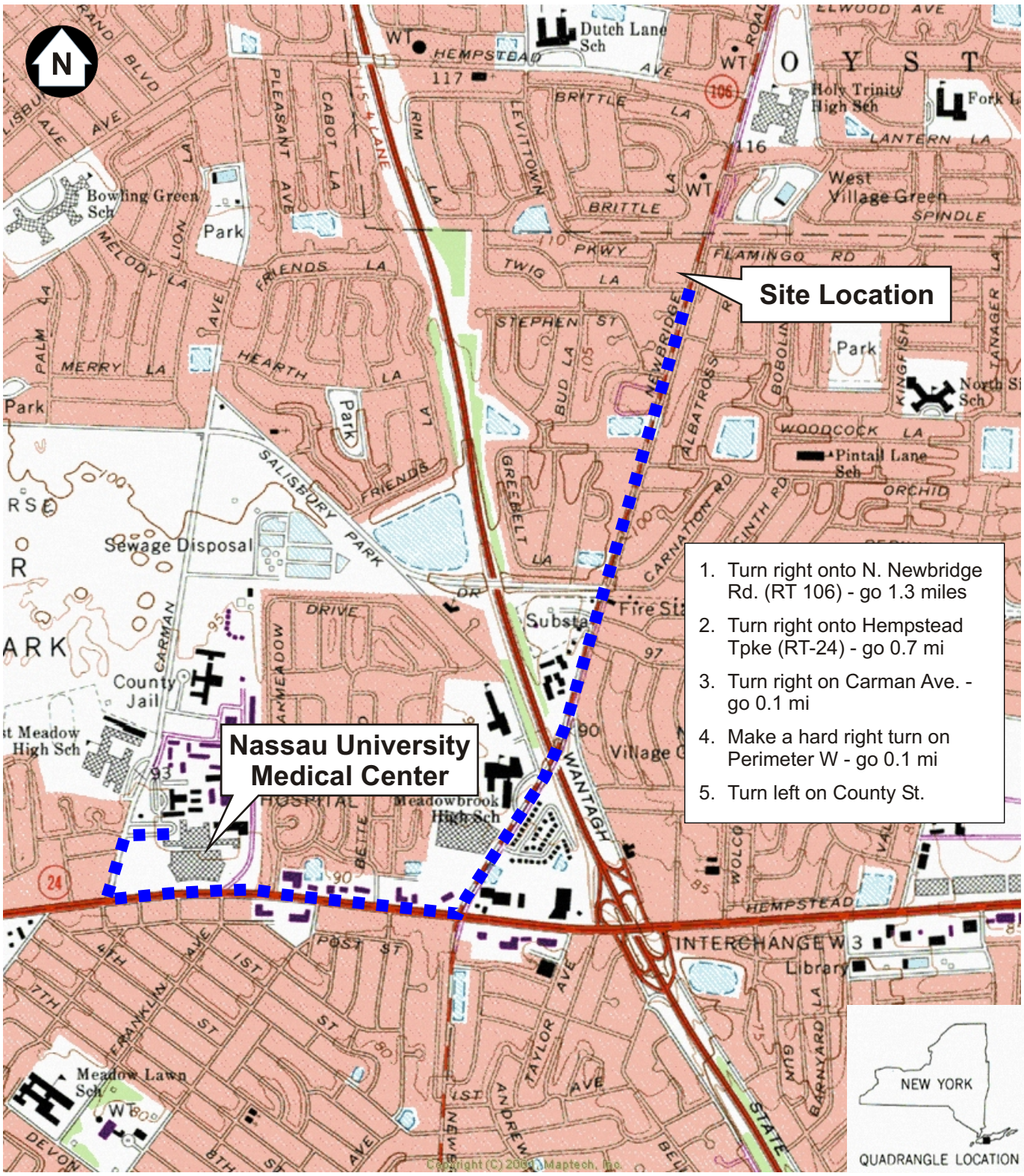
ALTERNATE HOSPITAL:

Secondary Hospital: New Island Hospital
Address: 4295 Hempstead Tpke, Oyster Bay, NY
Telephone Number: (516) 579-6000

DIRECTIONS TO ALTERNATE HOSPITAL (attached map):

1. Take a right onto Twig Lane - go 1.3 mi
2. Turn right on Hempstead Tpke (RT-24) - go 3.5 mi
8. Arrive New Island Hospital

Driving distance: 4.8 miles / 9 minutes



Scale in Miles

0 0.25 0.5

Prepared/Date: JPH 7/27/06
Checked/Date: JPC 7/27/06

NYSDEC Arba Dry Cleaners Site Levittown, NY	MACTEC	Primary Hospital Route Project 3612062052

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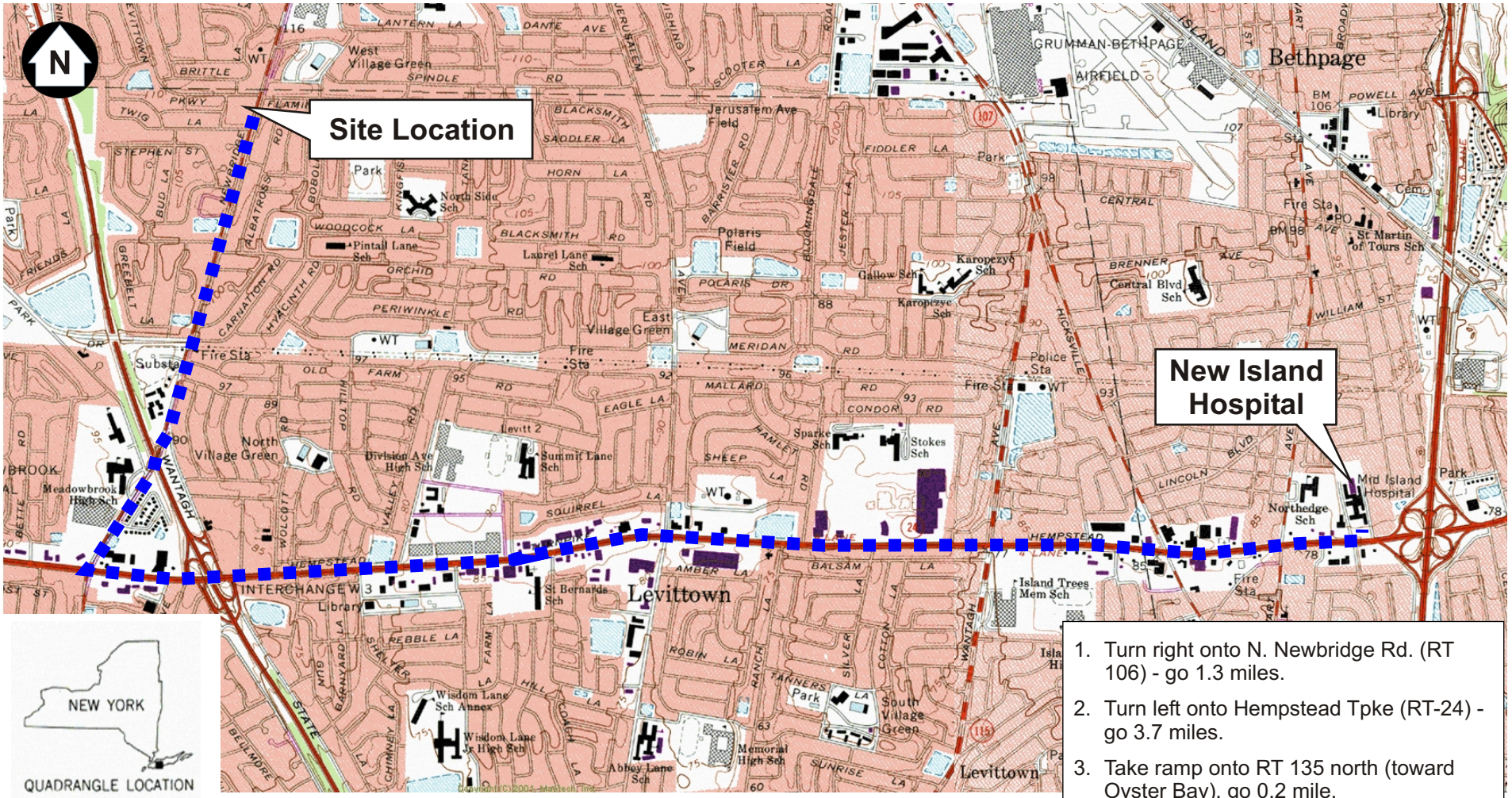


1. Turn right onto N. Newbridge Rd. (RT 106) - go 1.3 miles.
2. Turn left onto Hempstead Tpke (RT-24) - go 3.7 miles.
3. Take ramp onto RT 135 north (toward Oyster Bay), go 0.2 mile.
4. Take exit #7/RT 24 West onto Hempstead Tpke (RT-24) toward Hempstead, go 0.4 mile.
5. Arrive at 4295 Hempstead Tpke, New Island Hospital.

Prepared/Date: JPH 7/27/06
Checked/Date: JPC 7/27/06

NYSDEC Arba Dry Cleaners Site Levittown, NY	MACTEC	Alternate Hospital Route Project 3612062052

PORT2006031b.cdr

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Decontamination **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Establish Decontamination Station	1A) Materials Handling	1A) Materials Handling ▪ Use proper lifting techniques ▪ Use mechanical aids, if available, to move heavy items.
2. Decontamination / Steam cleaning.	2A) Struck by steam/hot water/pressure washing	2A) Struck by steam/hot water ▪ Workers not directly engaged in steam cleaning operations must stay clear. ▪ Workers using steam cleaning equipment must be trained on operation and safety devices/procedures using the owners/operators manual. ▪ Use face shield **and** safety glasses or goggles, if steam cleaning. ▪ Stay out of the splash/steam radius. ▪ Pressure washer must have dead man switch. ▪ Do not direct steam at anyone. ▪ Do not hold objects with your feet or hands. ▪ Ensure that direction of spray minimizes spread of contaminants of concern. ▪ Use shielding as necessary.
	2B) Exposure to contaminants	2B) Exposure to contaminants ▪ Conduct air monitoring (see HASP). ▪ Wear proper PPE (see HASP). ▪ See MSDSs for hazards associated with the decon solutions used (if other than water alone us used).
	2C) Slips/Trips/Falls	2C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
3. Vehicle Decontamination	3A) Vehicle traffic in and out of the CRZ	3A) Large Vehicle Traffic ▪ Always wear a hard hat, steel toe boots, and a high visibility vest (unless Tyveks are used and are high visibility). ▪ Vehicle drivers are not to exit the vehicle in the CRZ. ▪ Identify an individual to communicate with vehicle drivers and maintain order ▪ Trucks will be lined with plastic and kept out of direct contact with any contaminated materials during loading. Wear PPE when removing plastic lining from truck beds. ▪ If not in the vehicle, obtain eye contact with the driver, so he is aware of your presence and location in the CRZ. ▪ If you are driving the vehicle, be aware of personnel in the CRZ and maintain communication with the identified personnel.
	3B) Exposure to contaminants	3B) Exposure to contaminants ▪ Use safety glasses or goggles, Polycoated Tyvek (if level of contamination poses dermal hazard or to keep work clothes dry), high visibility vest (if high visibility Tyveks are not used) hard hats, steel toe boots, and gloves while cleaning contaminated materials. ▪ Do not doff PPE until decontamination of the vehicle is complete and a decontamination certificate has been issued by the HSO. ▪ Conduct air monitoring (see HASP). ▪ See MSDSs for hazards associated with the decon solutions (if other than water alone is used).

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Decontamination **Date of Analysis:** 5/30/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3C) Slips/Trips/Falls	3C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
4. Equipment and Sample Decontamination	4A) Chemical exposure when handling contaminated sample jars and equipment	4A) Chemical exposure ▪ Wear PPE as outlined in the HASP. ▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for contaminants ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.) if appropriate (see HASP)
	4B) Materials Handling related injuries	4B) Materials Handling related injuries ▪ Use proper lifting techniques when lifting heavy equipment ▪ Use two person lift for heavy coolers
5. Personal Decontamination	4C) Exposure to contaminants	4C) Exposure to contaminants ▪ Avoid bringing contaminated materials via shoes and clothing into the CRZ by examining such prior to exiting the EZ. ▪ Removal of PPE will be performed by the following tasks in the listed order: ▪ Gross boot wash and rinse and removal ▪ Outer glove removal ▪ Suit removal ▪ Respirator removal (if worn). ▪ Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Respirators will be removed and decontaminated at a specified location within the CRZ by a designated technician, then placed in storage bag. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ See MSDSs for hazards associated with the decontamination solutions used. ▪ Decon solutions will be disposed of according to the work plan.

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Field Work - General **Date of Analysis:** 4/21/06

Minimum Recommended PPE*: hard hat, steel-toed boots, safety glasses
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization/ See Mobilization/Demobilization and Site Preparation JHA Demobilization and Site Preparation	1A) See Mobilization/Demobilization and Site Preparation JHA	1A) See Mobilization/Demobilization and Site Preparation JHA
2. Communication	2A) Safety, crew unity	2A) Talk to each other. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the wherabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Review Emergency Evacuation Procedures (see below).
3. Walking and working in the field	3A) Falling down, twisted ankles and knees, poor footing	3A) Always watch your footing. ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	3B) Falling objects	3B) Protect head agains falling objects. ▪ Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. ▪ Stay out of the woods during extremely high winds.
	3C) Damage to eyes	3C) Protect eyes: ▪ Watch where you walk, ecpecially around trees and brush with limbs sticking out. ▪ Exercise caution when clearing limbs from tree trunks. Advise wearing eye protection. ▪ Ultraviolet light from the sun can be damaging to the eyes; look for sunglasses that specify significant protection from UV-A and UV-B radiation. If safety glasses require, use one's with tinted lenses
	3D) Bee and wasp stings	3D) See JHA for Insect Stings and Bites
	3E) Ticks and infected mosquitos	3E) See JHA for Insect Stings and Bites
	4A) Back Injuries	4A) Back Injuries ▪ Site personnel will be instructed on proper lifting techniques. ▪ Mechanical devices should be used to reduce manual handling of materials. ▪ Team lifting should be utilized if mechanical devices are not available.
	4B) Slips/Trips/Falls	4B) Slips/Trips/Falls ▪ Maintain work areas safe and orderly; unloading areas should be on even terrain; mark or repair possible tripping hazards. ▪ Site SHSO inspect the entire work area to identify and mark hazards.
	4C) Vehicular Traffic	4C) Vehicular Traffic ▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads.

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Field Work - General **Date of Analysis:** 4/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4D) Overhead Hazards	4D) Overhead Hazards ▪ Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. ▪ All ground personnel will stay clear of suspended loads. ▪ All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. ▪ All overhead hazards will be identified prior to commencing work operations.
	4E) Dropped Objects	4E) Dropped Objects ▪ Steel toe boots meeting ANSI Standard Z41 will be worn.
	4F) Noise	4F) Noise ▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); all equipment will be equipped with manufacturer's required mufflers. Hearing protection shall be worn by all personnel working in or near heavy equipment.
	4G) Eye Injuries	4G) Eye Injuries ▪ Safety glasses meeting ANSI Standard Z87 will be worn.
	4H) Heavy Equipment (overhead hazards, spills, struck by or against)	4H) Heavy Equipment ▪ Equipment will have seat belts. ▪ Operators will wear seat belts when operating equipment. ▪ Do not operate equipment on grades that exceed manufacturer's recommendations. ▪ Equipment will have guards, canopies or grills to protect from flying objects. ▪ Ground personnel will stay clear of all suspended loads. ▪ Ground personnel will wear high visibility vests ▪ Spill and absorbent materials will be readily available. ▪ Drip pans, polyethylene sheeting or other means will be used for secondary containment. ▪ Ground personnel will stay out of the swing radius of excavators. ▪ Eye contact with operators will be made before approaching equipment. ▪ Operator will acknowledge eye contact by removing his hands from the controls. ▪ Equipment will not be approached on blind sides. ▪ All equipment will be equipped with backup alarms and use spotters when significant physical movement of equipment occurs on-site, (i.e., other than in place excavation or truck loading).
	4I) Struck by vehicle/equipment	4I) Struck by vehicle/equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times and will wear high visibility vests. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop!

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Field Work - General **Date of Analysis:** 4/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4J) Struck/cut by tools	4J) Struck/cut by tools ▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Guards will be kept in place while using hand and power tools.
	4K) Caught in/on/between	4K) Caught in/on/between ▪ Workers will not position themselves between equipment and a stationary object. ▪ Workers will not wear long hair down (place in pony-tail and tuck into shirt) or jewelry if working with tools/machinery.
	4L) Contact with Electricity/Lightning	4L) Contact with Electricity/Lighting ▪ All electrical tools and equipment will be equipped with GFCI. ▪ Electrical extension cords will be of the "Hard" or "Extra Hard" service type. ▪ All extension cords shall have a three-blade grounding plug. ▪ Personnel shall not use extension cords with damaged outer covers, exposed inner wires, or splices. ▪ Electrical cords shall not be laid across roads where vehicular traffic may damage the cord without appropriate guarding. ▪ All electrical work will be conducted by a licensed electrician. ▪ All utilities will be marked prior to excavation activities. ▪ All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead powerlines known to be 50 kV or less and 35 feet from all others.) ▪ The SHSO shall halt outdoor site operations whenever lightning is visible, outdoor work will not resume until 30 minutes after the last sighting of lightning.
	4M) Equipment failure	4M) Equipment failure ▪ All equipment will be inspected before use. If any safety problems are noted, the equipment should be tagged and removed from service until repaired or replaced.
	4N) Hand & power tool usage.	4N) Hand & power tool usage ▪ Daily inspections will be performed. ▪ Remove broken or damaged tools from service. ▪ Use the tool for its intended purpose. ▪ Use in accordance with manufacturers instructions.
4. Environmental health considerations	4O) Heat Stress	4O) Take precautions to prevent heat stress ▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. NOTE: The severity of the effects of a given environmental heat stress is decreased by reducing the work load, increasing the frequency and/or duration of rest periods, and by introducing measures which will protect employees from hot environments. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability).

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Field Work - General **Date of Analysis:** 4/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
4. Environmental health considerations (Continued)	4O) Heat Stress (Continued)	▪ Allow approximately 2 weeks with progressive degrees of heat exposure and physical exertion for substantial acclimatization. ▪ Acclimatization is necessary regardless of an employee's physical condition (the better one's physical condition, the quicker the acclimatization). Tailor the work schedule to fit the climate, the physical condition of employees, and mission requirements. ▪ A reduction of work load markedly decreases total heat stress. ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.
	4P) Wet Bulb Globe Temperature (WBGT) Index	4P) WBGT ▪ Curtail or suspend physical work when conditions are extremely severe (see attached Heat Stress Index). ▪ Compute a Wet Bulb Globe Temperature Index to determine the level of physical activity (take WBGT index measurements in a location that is similar or closely approximates the environment to which employees will be exposed). WBGT THRESHOLD VALUES FOR INSTITUTING PREVENTIVE MEASURES 80-90 degrees F — Fatigue possible with prolonged exposure and physical activity. 90-105 degrees F — Heat exhaustion and heat stroke possible with prolonged exposure and physical activity. 105-130 degrees F — Heat exhaustion and heat stroke are likely with prolonged heat exposure and physical activity.
	4Q) Cold Extremes	4Q) Take precautions to prevent cold stress injuries ▪ Cover all exposed skin and be aware of frostbite. While cold air will not freeze the tissues of the lungs, slow down and use a mask or scarf to minimize the effect of cold air on air passages. ▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration.
	4R) Wind	4R) Effects of the wind ▪ Wind chill greatly affects heat loss (see attached Wind Chill Index). ▪ Avoid marking in old, defective timber, especially hardwoods, during periods of high winds due to snag hazards.
	4S) Thunderstorms	4S) Thunderstorms ▪ Monitor weather channels to determine if electrical storms are forcased. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thurnder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds. ▪ Only return to work 30 minutes after the after the last strike or sound of thunder

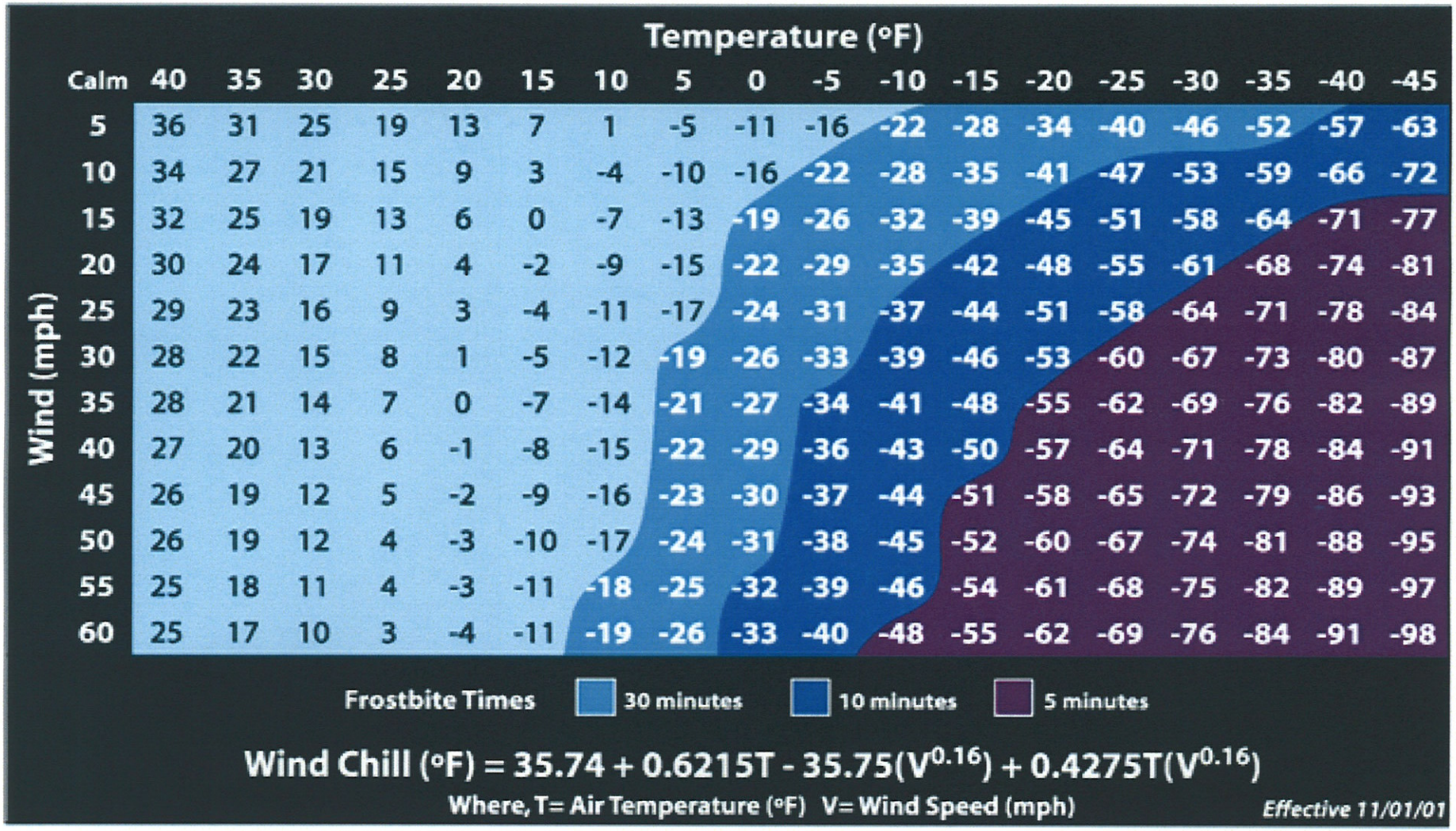
Heat Index Chart

Temperature	% Relative Humidity															
	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
110	108	112	117	123	130											
105	102	105	108	113	117	122	130									
100	97	98	102	104	107	110	115	120	126	132						
95	91	93	95	96	98	100	104	106	109	113	119	124	130			
90	86	87	88	90	91	92	95	97	98	100	103	106	110	114	117	121
85	81	82	83	84	85	86	87	88	89	90	92	94	96	97	100	102
80	76	77	78	78	79	79	80	81	82	83	84	85	86	87	88	89

Legend

80-89 degrees	Fatigue is possible with prolonged exposure and/or physical activity.
90-104 degrees	Sunstroke, heat cramps and heat exhaustion are possible with prolonged exposure and/or physical activity.
105-129 degrees	Sunstroke, heat cramps and heat exhaustion are likely. Heat stroke is possible with prolonged exposure and/or physical activity.
130+ degrees	Heatstroke/sunstroke is highly likely with continued exposure.

Wind Chill Chart



Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Groundwater Sampling **Date of Analysis:** 4/25/06

Minimum Recommended PPE*: steel-toed boots, safety glasses, chemical resistant gloves
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for sampling event	1A) Chemical exposure	1A) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
2. Carrying equipment to well	2A) Back or muscle strain	2A) Back or muscle strain ▪ Use proper lifting techniques when lifting pumps or generators ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
3. Calibrate monitoring equipment	3A) Exposure to calibration gases	3A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Opening the well cap, taking water level readings	4A) Contact with poisonous plants or the oil from poisonous plants	4A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Wear PPE as described in the HASP. ▪ Do not touch anything part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP.
	4B) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	4B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	4C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated groundwater/ soil); liquid splash; flammable atmospheres.	4C) Exposure to hazardous substances ▪ After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before obtaining water level and before sampling. ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	4D) Back strain due to lifting bailers or pumps and from moving equipment to well locations	4D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Groundwater Sampling **Date of Analysis:** 4/25/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4E) Foot injuries from dropped equipment	4E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear Steel toed boots
5. Collecting water samples	5A) Fire/Explosion/Contamination hazard from refueling generators	5A) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	5B) Electrocution	5B) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	5C) Exposure to contaminants	5C) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	5D) Infectious water born diseases	5D) Infectious water born diseases ▪ Wear chemical resistant gloves and other PPE – as identified in HASP ▪ Prevent water from contacting skin ▪ Wash exposed skin with soap and water ASAP after sampling event ▪ Ensure that all equipment is adequately decontaminated using a 10% bleach solution
	5E) Exposure to water preservatives	5E) Exposure to water preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ When preserving samples always add acid to water, avoid the opposite. ▪ See JHA Acids - Sampling
	5F) Slips/trips/falls	5F) Slips/trips/falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums for removal ▪ Wear good slip resistant footwear

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Groundwater Sampling **Date of Analysis:** 4/25/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	5G) Repetitive Motion and other Ergonomic Issues	3A) Ergonomic Issues ▪ Use mechanical means where possible to raise and lower equipment into well. ▪ Alternate raising and lowering equipment between field sampling team members, and alternate bailing the well. ▪ Use safe lifting techniques.
6. Sample Processing	6A) Contaminated water	6A) Contaminated water ▪ Wear appropriate PPE as identified in HASP ▪ Prevent water from contacting skin ▪ Work in well ventilated area – upwind of samples ▪ Waste will be returned to the operation office for storage and disposal
7. Shipping Samples	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage ▪ Wear appropriate chemical resistant gloves as identified in HASP. ▪ Wear leather or insulated gloves when handling dry ice. ▪ Follow safe lifting techniques – get help lifting heavy coolers. ▪ Samples that contain hazardous materials under the DOT definition, must be packaged, manifested and shipped by personnel that have the appropriate DOT HAZMAT training.

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Insect Stings and Bites **Date of Analysis:** 4/20/06

Minimum Recommended PPE*: Long sleeved shirt and pants, light colored clothing
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Traveling/working in areas with potential Tick Bites –Example outdoor wooded areas or fields.	1. Lyme Disease, Rocky Mountain Spotted Fever, etc.	1A) Spray clothing with insect repellant as a barrier. 1B) Wear light colored clothing that fits tightly at the wrists, ankles, and waist. 1C) Each outer garment should overlap the one above it. 1D) Cover trouser legs with high socks or boots. 1E) Tuck in shirt tails. 1F) Search the body on a regular basis, especially hair and clothing; ticks generally do not attach for the first couple of hours. 1G) If a tick becomes attached, pull it by grasping it as close as possible to the point of attachment and pull straight out with gentle pressure. Wash skin with soap and water then cleanse with rubbing alcohol. Place the tick in an empty container for later identification, if the victim should have a reaction. Record dates of exposure and removal. 1H) Do not try to remove the tick by burning with a match or covering it with chemical agents. 1I) If you can not remove the tick, or the head detaches, seek propmt medical help. 1J) Watch for warning signs of illness: a large red spot on the bite area; fever, chills, headache, joint and muscle ache, significant fatigue, and facial paralysis are reactions that may appear within two weeks of the attack. Symptoms specific to Lyme disease include: confusion, short-term memory loss, and disorientation.
2. Working/traveling in areas with potential bee and wasp stings-Example wooded areas and fields	2. Allergic reactions, painful stings	2A) Be alert to hives in brush or in hollow logs. Watch for insects travelling in and out of one location. 2B) If you or anyone you are working with is known to have allergic reactions to bee stings, tell the rest of the crew and your supervisor. Make sure you carry emergency medication with you at all times. 2C) Wear long sleeve shirts and trousers; tuck in shirt.. Bright colors and metal objects may attract bees. 2D) If you are stung, cold compresses may bring relief. 2E) If a stinger is left behind, scrape it off the skin. Do not use a tweezers as this squeezes the venom sack, worsening the injury. 2F) If the victim develops hives, asthmatic breathing, tissue swelling, or a drop in blood pressure, seek medical help immediately. Give victim antihistime, (Benadryl, chlo-amine tabs).
3. Traveling/working in areas of potential Mosquito Bites-Example- Woods, fields, near bodies of water and etc.	3. Skin irritation, encephalitis	3A) Wear long sleeves and trousers. 3B) Avoid heavy scents. 3C) Use insect repellants. If using DEET, do not apply directly to skin, apply to clothing only. 3D) Carry after-bite medication to reduce skin irritation.

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 4/21/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for Site Visit	1A) N/A	1A) Prior to leaving for site ▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ If respiratory protection is required/potentially required, ensure that training and fit-testing has occurred within the past year. ▪ Familiarize yourself with route to the site
	1B) Vehicle defects	1B) Inspect company owned/leased vehicle for defects such as: ▪ Flat tires ▪ Windshield wipers worn or torn ▪ Oil puddles under vehicle ▪ Headlights, brake lights, turn signals not working
	1C) Insufficient emergency equipment, unsecured loads	1C) Insufficient emergency equipment, unsecured loads ▪ Ensure vehicle has first aid kit and that all medications are current (if first aid kits are not provided at the site) ▪ Ensure vehicle is equpped with warning flashers and/or flares and that the warning flashers work ▪ Cell phones are recommended to call for help in the event of an emergency ▪ Vehicles carrying tools must have a safety cage in place. All tools must be properly secured ▪ Vehicles must be equipped with chocks if the vehicle is to be left running, unattended. ▪ Ensure sufficient gasoline is in the tank
2. Operating vehicles – general	2A) Collisions, unsafe driving conditions	2A) Drive Defensively! ▪ Seat belts must be used at all times when operating any vehicle on company business. ▪ Drive at safe speed for road conditions ▪ Maintain adequate following distance ▪ Pull over and stop if you have to look at a map ▪ Try to park so that you don't have to back up to leave.
3. Driving to the jobsite	3A) Dusty, winding, narrow roads	3A) Dusty, winding, narrow roads ▪ Drive confidently and defensively at all times. ▪ Go slow around corners, occasionally clearing the windshield.
	3B) Rocky or one-lane roads	3B) Rocky or one-lane roads ▪ Stay clear of gullies and trenches, drive slowly over rocks. ▪ Yield right-of-way to oncoming vehicles---find a safe place to pull over.
	3C) Stormy weather, near confused tourists	3C) Stormy weather, near confused tourists ▪ Inquire about conditions before leaving the office. ▪ Be aware of oncoming storms. ▪ Drive to avoid accident situations created by the mistakes of others.
	3D) When angry or irritated	3D) When angry or irritated ▪ Attitude adjustment; change the subject or work out the problem before driving the vehicle. Let someone else drive.

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 4/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3E) Turning around on narrow roads	3E) Turning around on narrow roads ▪ Safely turn out with as much room as possible. ▪ Know what is ahead and behind the vehicle. ▪ Use a backer if available.
	3F) Sick or medicated	3F) Sick or medicated ▪ Let others on the crew know you do not feel well. ▪ Let someone else drive.
	3G) On wet or slimy roads	3G) On wet or slimy roads ▪ Drive slow and safe, wear seatbelts.
	3H) Animals on road	3H) Animals on road ▪ Drive slowly, watch for other animals nearby. ▪ Be alert for animals darting out of wooded areas
4. Gain permission to enter site	4A) Hostile landowner, livestock, pets	4A) Hostile landowner, livestock, pets ▪ Talk to land owner, be courteous and diplomatic ▪ Ensure all animals have been secured away from work area
5. Mobilization/ Demobilization of Equipment and Supplies	5A) Struck by Heavy Equipment/Vehicles	5A) Struck by heavy equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times ▪ Employees shall wear a high visibility vest or T-shirt (reflective vest required if working at night). ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation.
	5B) Struck by Equipment/Supplies	5B) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
	5C) Overexertion Unloading/Loading Supplies	5C) Overexertion Unloading/Loading Supplies ▪ Train workers on proper body mechanics, do not bend or twist at the waist while exerting force or lifting. ▪ Tightly secure all loads to the truck bed to avoid load shifting while in transit.
	5D) Caught in/on/between	5D) Caught in/on/between ▪ Do not place yourself between two vehicles or between a vehicle and a fixed object.
	5E) Slip/Trip/Fall	5E) 1E). Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas. ▪ Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. ▪ Drivers will check surface before stepping, not jumping down.
	5F) Vehicle accident	5F) Vehicle accident ▪ Employees should follow MACTEC vehicle operation policy and be aware of all stationary and mobile vehicles.

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 4/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
6. Site Preparation	6A) Slip/Trip/Fall	6A) Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas ▪ Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. ▪ Drivers will check surface before stepping, not jumping down.
7. Installation of soil erosion and sediment controls	7A) Overexertion	7A) Overexertion ▪ Workers will be trained in the proper method of placing erosion controls. ▪ Do not bend and twist at the waist while lifting or exerting force.
	7B) Struck by Equipment/Supplies	7C) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
8. Driving back from the jobsite	8A) See hazards listed under item #3	8A) See safe work practices under item #3

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Working with Preservatives (Acids) **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: Safety glasses/goggles, nitrile gloves,
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Opening the box of ampoules	1A) Cuts or punctures with a knife	1A) Cuts or punctures with a knife ▪ Use appropriate techniques when handling a knife. Always cut away from you.
	1B) Broken ampoules in the box. Cuts from the broken glass.	1B) Broken ampoules in the box. Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Dispose of the preservative and broken glass by approved methods.
	1C) Broken ampoules in the box. Breathing fumes.	1C) Broken ampoules in the box. Breathing fumes. ▪ Wear safety goggles and protective gloves. ▪ Always work in a well-ventilated area.
2. Breaking top of glass ampoule	2A) Cuts from the broken glass.	2A) Cuts from the broken glass ▪ Wear safety goggles and protective gloves. ▪ Use a paper towel to wrap ampoule in to snap the top or use an ampoule breaker. ▪ Always point the ampoule away from you when you snap off the top.
	2B) Skin contact chemical burns.	2B) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves. ▪ Fumes may come into contact with the perspiration on your skin and rehydrate to form an acid. ▪ If your skin itches, flush affected area for 15 minutes with water.
	2C) Eye contact	2C) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	2D) Breathing fumes	2D) Breathing fumes ▪ HNO_3 and HCL have high vapor pressure. Always work in a well-ventilated area.
3. Adding acid to sample	3A) Chemical reaction	3A) Chemical reaction ▪ Wear safety goggles and protective gloves. Acid may react with high alkaline sample and fizz (releases CO_2).
	3B) Eye contact	3B) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	3C) Skin contact chemical burns.	3C) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves.
4. Ampoule disposal	4A) Cuts from the broken glass.	4A) Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Place used ampoules in an empty, non-reactive container in the field and bring it back to the office. Dispose of the preservative and broken glass by approved methods.