WORK PLAN

SITE CHARACTERIZATION
JUNG SUN LAUNDRY PLUME
Site Number: 241102

Work Assignment No.
D004436-11

Prepared for:

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
625 Broadway
Albany, New York 12233

December 2007

Prepared by:

Earth Tech Northeast, Inc.
300 Broadacres Drive
Bloomfield, NJ 07003-3153

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1.0 INTRODUCTION

Earth Tech Northeast, Inc. (Earth Tech) has been issued Work Assignment # D004436-11 under the New York State Department of Environmental Conservation (NYSDEC) State Superfund Standby Program. The site under this work assignment is Jung Sun Laundry Plume (Site # 241102). The location of the site is shown on Figure 1.

The specific objectives of this project are to gather information to identify the source of the volatile organic contamination in the groundwater, determine environmental sampling needs and determine whether the site should be reclassified or nominated the site to the NPL. The work will be performed in accordance with NYSDEC Division of Environmental Remediation Draft DER-10 Technical Guidance for Site Investigation and Remediation, December 2002.

Earth Tech has developed and submitted this management plan for NYSDEC's review and approval. It includes a detailed budget based upon the scope of work outlined in the work assignment (WA) letter issued by the Department on August 31, 2007, and as modified based on the initial site visit and scoping session conducted on September 19, 2007. In addition, this submittal includes a staffing plan and proposed schedule and a subcontractor utilization plan including a Minority/Women Business Enterprise (M/WBE) utilization plan.

1.1 Site Description

Information on the location, previous investigations, and site geology are provided in the subsections below.

1.1.1 General/Location

The Jung Sun Laundry Plume site (herein identified as the "site") is located at 37-10 24th Street, Long Island City, Queens, New York. Jung Sun Laundry has been in operation since the 1930s. From the late 1980s to the mid 1990s, the site was operated as a dry cleaner. The site then transitioned from dry cleaning back to laundry service. The site is currently operating as a laundry on a seven day a week, 14-hour a day schedule. Scalamandre Silks is adjacent to this site. Textile fabric manufacturing has been performed on this property since 1936. Scalamandre Silks manufacturing facility has been in operation since the 1950s. Based on site use, it is likely that chemical dyes, paints, solvents and softening agents were used historically as part of day-to-day operations.

1.1.2 Previous Investigations

Jung Sun Laundry conducted a limited environmental investigation of the property for business purposes, but this report has not been provided to NYSDEC to date.

Aarron & Wright completed a Phase 1 Environmental Site Assessment in September 2003, a Phase 2 Limited Subsurface Investigation in October 2003 and a Phase 2 Limited Groundwater Investigation in December 2003 on the adjacent Scalamandre Silks property. During the Phase 2 Limited Subsurface Investigations, 5 borings were advanced to a depth of 10 feet, but no samples were collected because the PID readings were 0 ppm and there was no visible indication of contamination. A groundwater sample was collected from a temporary well. The trichloroethene (TCE) and tetrachloroethene (PCE) exceeded the NYSDEC groundwater quality standards of 5 ug/L with concentrations of 7.17 ug/L and 37.7 ug/L, respectively. During the Phase 2 Limited Groundwater Investigation, 5 permanent monitoring wells were installed. Samples from these wells exceeded the NYSDEC groundwater quality standards for TCE, PCE or vinyl chloride. The highest levels were detected in the monitoring well adjacent to the Jung Sun Laundry.

1.1.3 Site Geology and Hydrogeology

Previous reports (Aarron & Wright for Scalamander Silk) indicate that subsurface materials at the site consist of sand with some silt.

Based on groundwater elevation data recorded by Aarron & Wright measurements, the depth to groundwater was approximately 15 ft bgs in December 2003. Aarron & Wright reported that the groundwater flow direction is towards the south west, but there appears to be localized groundwater flow towards the south/southeast at the eastern side of the Scalamander Silk property.

1.2 Work Plan Organization

This volume, the Work Plan proper, provides the background information, administrative information including subcontracting, schedule, and budget (provided as Appendix 1 to this volume). Additional project plans which are an integral component of the project documents are provided as attachments to this Work Plan and include:

Field Activities Plan – Attachment A

Quality Assurance Project Plan – Attachment B

Health and Safety Plan – Attachment C

Community Air Monitoring Plan – Attachment D.

The scope and content of each of these plans is summarized in Section 2 of this Work Plan.

2.0 SCOPE OF WORK

The following scope of work has been developed in accordance with the NYSDEC direction. A draft scope of work was provided to NYSDEC on September 24, 2007 following the September 19, 2007 site visit. The draft scope was accepted by NYSDEC with some revision (inclusion of four soil samples during the MIP investigation).

The scope is divided into four tasks:

Task 1 – Project Scoping/Work Plan Development;

Task 2 – Field Investigation, and

Task 3 – Data Usability Summary Report and Site Characterization Report

2.1 Task 1 – Project Scoping/Work Plan Development

A meeting was held at the site on September 19 to discuss this work assignment and the requirements of the work plan. The Work Plan document will consist of the following components:

- Site Specific Field Activities Plan;
- Site-Specific Quality Assurance Project;
- Site-Specific Health and Safety Plan;
- Site-Specific Community Air Monitoring Plan
- Detailed Work Assignment Budget; and
- Final Progress Schedule.

These items are discussed below.

2.1.1 Field Activities Plan

The Draft Field Activities Plan (FAP), provided as Attachment A, describes the planned field activities. The major field activities include a membrane interface probe (MIP) investigation, the installation of three new permanent monitoring wells and sampling of groundwater at five existing monitoring wells and the three new monitoring wells. The FAP provides sufficient detail for field personnel to complete the tasks. The FAP will include a discussion of each of the activities to be completed including rationale, methodology, numbers of samples to be collected, disposal of IDW, etc. This information will also be summarized on tables and figures (type and number of samples, analyses, etc.).

To minimize redundancy, required items which are described in detail elsewhere will not be repeated in the FAP, but the relevant plan (and section) where the information is located will be cited.

2.1.2 Quality Assurance Project Plan

A site-specific Quality Assurance Project Plan (QAPP), provided as Attachment B, has been developed to address QA/QC requirements for this Work Assignment. The QAPP will include descriptions of the following:

- Project Management and Organization - This will include project personnel and responsibilities, identification of subcontractors, and schedule;
- Sample handling, including sample identification, bottles and custody;
- Data Quality Requirements - This will include definition of the data quality objectives, type and frequency of field QA/QC samples and field and laboratory QA/QC;
- Custody Documentation Requirements;
- Data Reduction, Validation and Reporting; and
- Audits and quality assurance reporting requirements.

To minimize redundancy, required items which are described in detail elsewhere will not be repeated in the QAPP, but the relevant plan (and section) where the information is located will be cited.

The estimated number of samples to be collected, including QA/QC samples, is shown on QAPP Table 2.

All samples collected will be analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified laboratory. The laboratory will provide analytical data in a NYSDEC Analytical Services Protocol Category B data deliverable format. Preliminary sample results will be provided in two weeks and final sample results will be provided within standard turnaround time (30 days). Laboratory data will be validated by a third party that is independent of the laboratory which performed the analyses and Earth Tech. The resume of the data validator will be provided for approval prior to initiating sampling activities. A data usability summary report (DUSR) will be submitted to the NYSDEC.

2.1.3 Health and Safety Plan

The site-specific worker health and safety requirements will be evaluated. A site-specific draft Health and Safety Plan (HASP) has been developed and is provided in Attachment C.

The HASP will include descriptions of the following:

- Project Management - This will include project personnel and responsibilities, and identification of subcontractors;
- An evaluation of the work to be performed including an assessment of risks and protective measures;
- Definition of Monitoring Requirements and Action Levels;

- Site control, Decontamination and Disposal Procedures;
- Emergency Contingency Plan; and,
- Administrative and reporting requirements.

To minimize redundancy, required items which are described in detail elsewhere will not be repeated in the HASP, but the relevant plan (and section) where the information is located will be cited.

Unless otherwise noted, it is assumed that all field work will be completed at USEPA level D personal protection in accordance with the Health and Safety Plan. Field activities will be monitored by an Earth Tech representative.

2.1.4 Community Air Monitoring Plan

The Community Air Monitoring Plan, which includes sections on Community Health and Safety and Community Air Monitoring, is provided as Attachment D to this work plan.

2.1.5 Detailed Budget

A detailed budget estimate for completing Task 1, Task 2, and Task 3 has been developed in the required 2.11 series cost schedules and are presented in Appendix 1 of this Plan.

2.1.6 Final Progress Schedule

A progress schedule has been developed for completing Tasks 1, 2, and 3 and is presented in Section 3 of this Plan. The schedule shown in Figure 2 identifies milestones and deliverables. In addition, the schedule includes estimated time periods for NYSDEC review of submittals.

2.2 Task 2 – Field Investigation

The activities that will be performed under this task involve the evaluation of the media at the site to determine the source of the historical contamination identified in the groundwater.

Prior to any intrusive field work, boring locations will be surveyed by ground penetrating radar (GPR) for utility clearance.

A MIP investigation consisting of up to 16 borings will be conducted. Up to four soil samples will be collected during the MIP investigation for laboratory analysis of volatile organic compounds (VOCs).

Three new monitoring wells will be installed in the vicinity of the site – one in the vicinity of the source location, identified during the MIP investigation and two upgradient. The three new monitoring wells (to be installed by Earth Tech) and five existing monitoring wells will be developed. The three new wells will be developed at least 8-hours after installation. A downhole camera will be used to identify the depth of the screening interval in the five existing monitoring wells. Groundwater will be sampled at the three new permanent monitoring wells and at the five existing monitoring well locations. These activities will be conducted to characterize groundwater VOC concentrations and determine the groundwater flow direction. Groundwater samples will be collected using low-flow methods and analyzed for VOCs. If contamination is observed or if elevated photo-ionization detector (PID) readings are recorded, soil samples will be collected at up to three of the monitoring well boring locations. Samples will be analyzed for VOCs.

Sampling locations, including MIP boring locations and existing and new monitoring wells, will be surveyed (horizontal and vertical) by a subcontracted NYS licensed surveyor.

Detailed information on the execution of this Task is provided in the FAP and QAPP.

2.3 Task 3 – Data Usability Summary and Site Characterization Reporting

2.3.1 Background Information/Records Search

A limited background information/records search will be conducted as part of the IIWA. Specifically, Earth Tech will acquire certain records required by ASTM E-1527-05 for a Phase I Environmental Site Assessment from a commercial vendor (EDR). The "all appropriate inquiry" (AAI) requirement is considered to have been met by the interviews conducted on site (September 19, 2007) by project personnel. However, the data obtained will not be full compliance with ASTM E-1527-05 (e.g., acquisition and review of property tax records and other local government information will not be obtained as part of this effort).

The documentation obtained though this effort will be appended to the Site Characterization report and key observations or findings will be discussed in the body of the report.

2.3.2 Data Usability Summary Report

A subcontractor to Earth Tech will review and validate the soil and groundwater data (VOCs by 8260B data). Subsequent to review of the items evaluated in the subcontractor DUSR and accompanying tables, Earth Tech then prepares a brief data usability summary. The data usability summary will be provided as part of the site investigation report.

A more detailed description of the scope and execution of the DUSR is provided in section 8.2 and 8.3 of the QAPP (Appendix B to this Work Plan).

2.3.3 Site Characterization Report

A dedicated field notebook will be maintained by the Earth Tech representative overseeing the site activities. Appropriate field forms and logs will be maintained and submitted to properly document site conditions and activities. Details are provided in the Field Activities Plan (Attachment A). These records will be included in the Site Characterization Report. Site Characterization Report will include conclusions and recommendations for future activities per section 3.13 of DER 10.

Earth Tech will submit four copies of a draft report that documents the work conducted and presents the results of the sample analysis for review and comment by NYSDEC and NYSDOH. The draft report will include the EDR files acquired as part of the background/records search described above (Section 2.3.1). Upon receipt of the comments, Earth Tech will revise the draft report and print the requested number of final copies indicated in the comment letter. (For cost estimation purposes, it is assumed that four copies of the final report will be submitted.) One copy of the final letter report; text, tables, maps, photos, etc., will be submitted as a single, bookmarked, pdf file. Electronic files will be submitted to NYSDEC on a compact disc.

The site investigation laboratory analytical data will be submitted in the NYSDEC "EZ-EDD" format as described in ASP 2005 Exhibit H, section 1.1.1.

3.0 STAFFING PLAN AND SCHEDULE

A tentative schedule for this assignment is presented on Figure 2.

An organizational chart is presented on Figure 3.

4.0 SUBCONTRACTING AND M/WBE PLAN

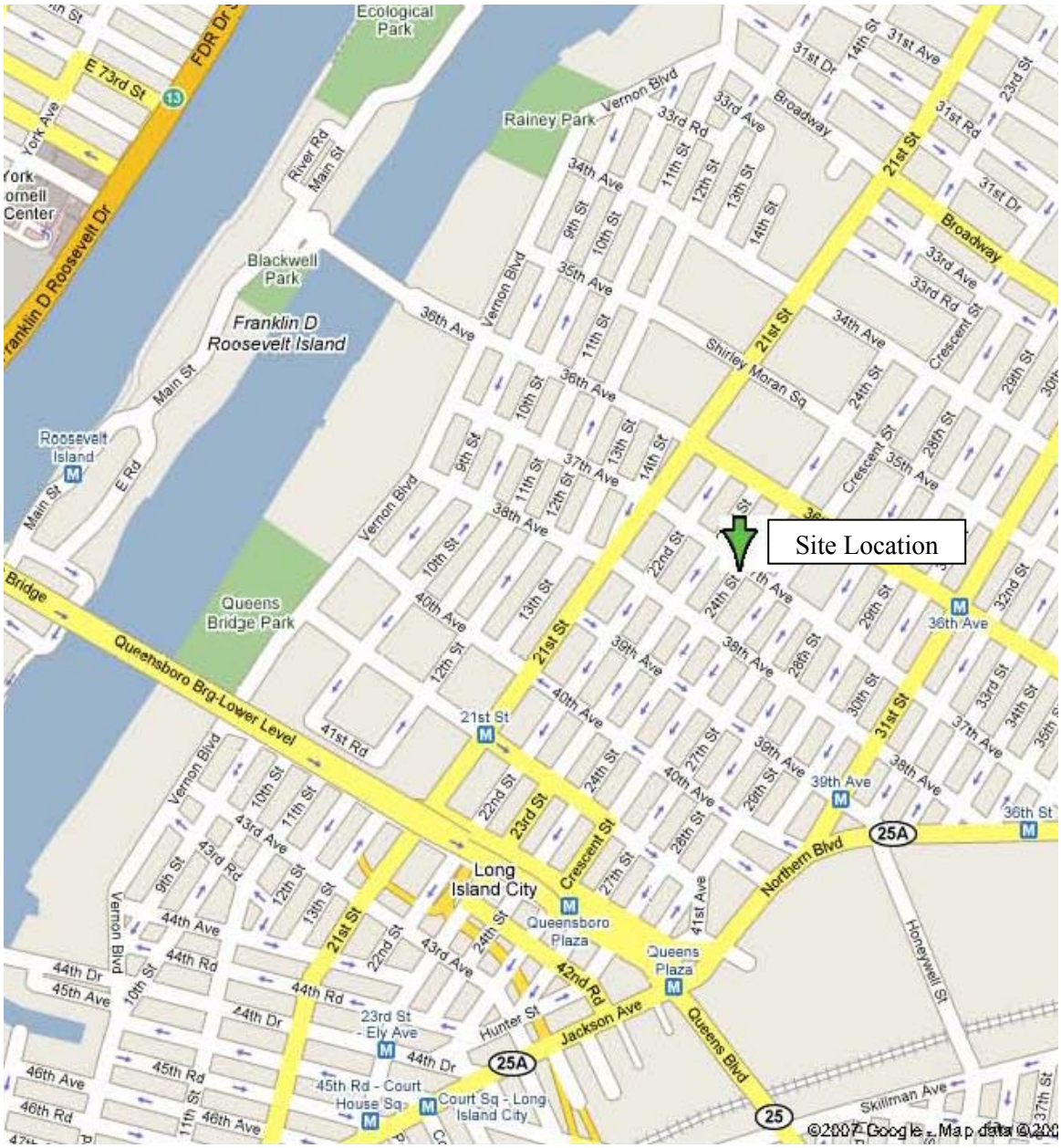
It is likely that the services of subcontractors will be required in the following areas:

- Land surveying and mapping Naik Consulting Group (MBE)
- Geophysical Survey / Utility Clearance by NAVEA Geophysics, Inc.
- Drilling services for the MIP investigation and the installation and development of monitoring wells by ZEBRA Environmental Corp.
- Laboratory services by Hampton Clarke Veritech (WBE)
- Data Validation and DUSR preparation by EDS/Nancy Weaver (WBE)

Earth Tech will make a good faith effort to use Minority Business Enterprises (MBE) and Women Business Enterprises (WBE) for at least 15 percent and 5 percent of the dollar value of the work, respectively.

5.0 PROJECT BUDGET

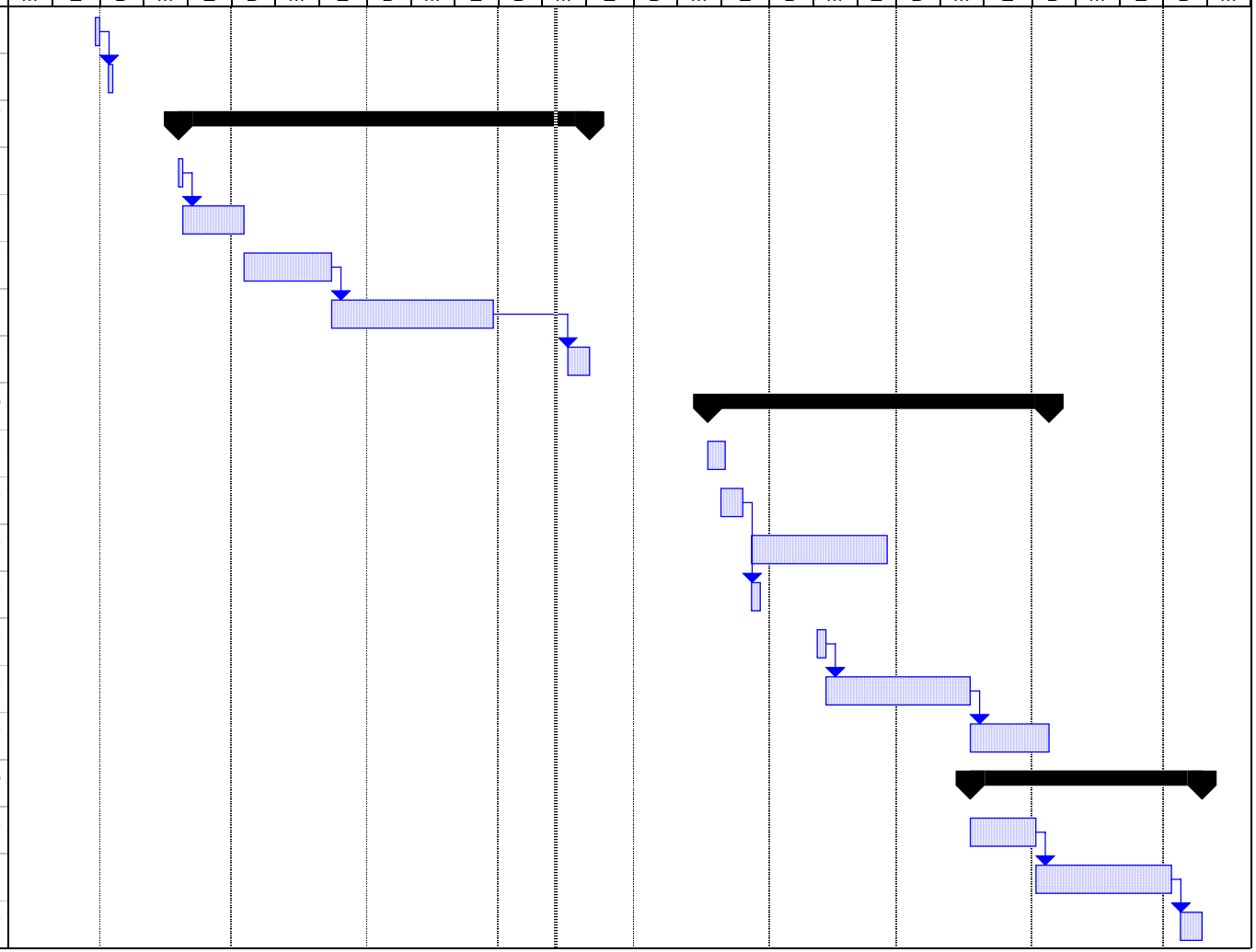
A summary of the proposed project level of effort and budget is presented in the attached 2.11 schedules for this assignment, provided as Appendix 1 to this Work Plan.



EARTH TECH	Project: Jung Sun Laundry Plume 37-10 24th Street Long Island City, Queens, NY	Figure 1 – Site Location

FIgure 2. Project Schedule

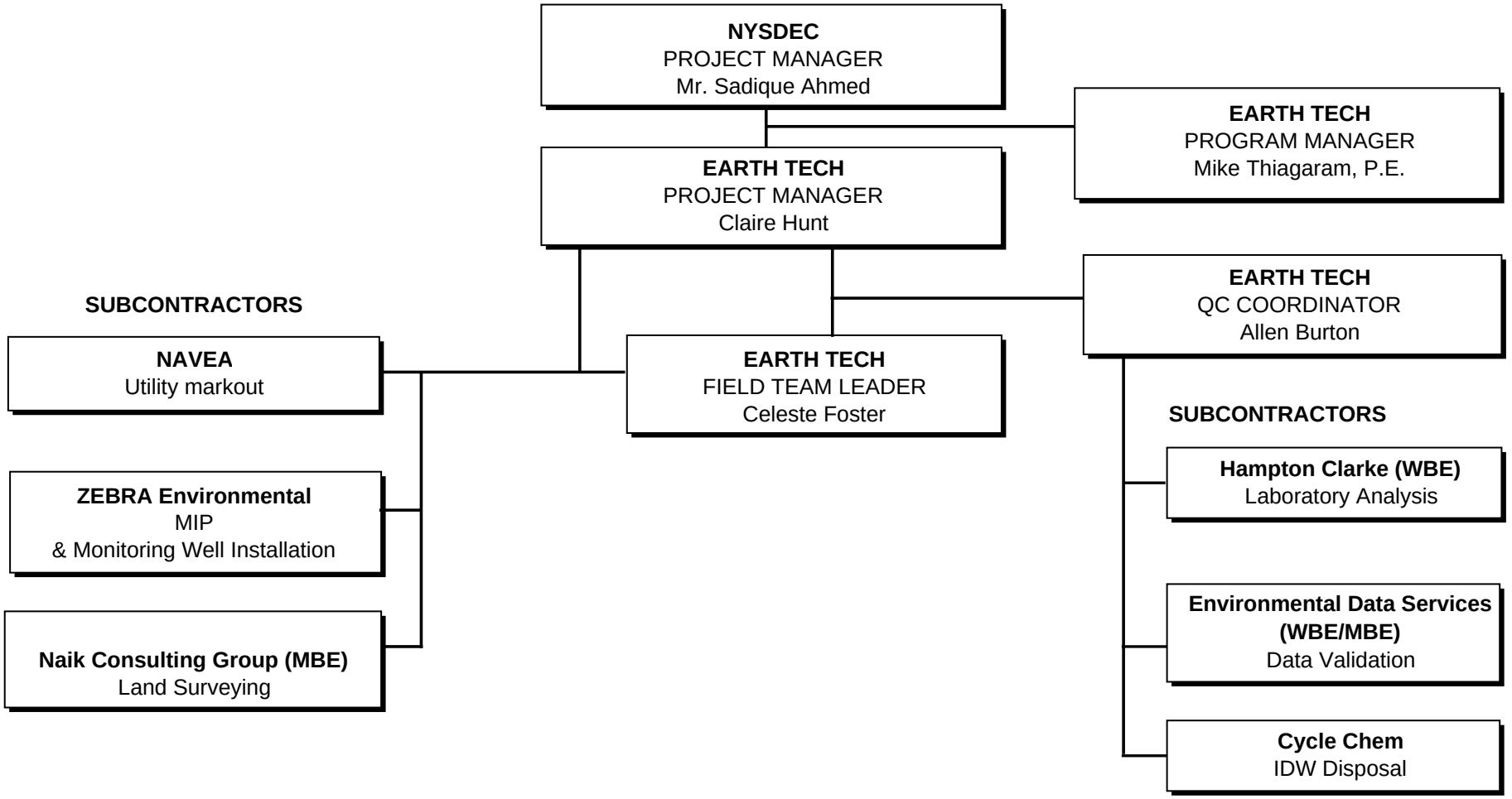
Task Name	Start
Issue Work Assignment (WA)	Fri 8/31/07
Acknowledge Receipt of WA	Mon 9/3/07
Task 1 Work Plan Development	**Wed 9/19/07**
Site Visit	Wed 9/19/07
Prepare Draft Scope	Thu 9/20/07
Prepare Task 1 Draft Work Plan	Thu 10/4/07
Review Draft Work Plan	Wed 10/24/07
Submit Task 1 Final Work Plan	Mon 12/17/07
Tasks 2 Field Work	**Fri 1/18/08**
Geophysical Survey	Fri 1/18/08
MIP & MW Installation/Development	Mon 1/21/08
Laboratory Analyses - Soil	Mon 1/28/08
Land Surveying	Mon 1/28/08
Groundwater Sampling	Tue 2/12/08
Laboratory Analyses - Groundwater	Thu 2/14/08
Data Validation	Tue 3/18/08
Task 3 Submit Draft Report	**Tue 3/18/08**
Draft Report Preparation	Tue 3/18/08
Approve Draft Report	Wed 4/2/08
Submit Final Report	Mon 5/5/08



Project: Schedule
Date: Fri 12/14/07

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary

FIGURE 3
PROJECT ORGANIZATION CHART
JUNG SUN LAUNDRY PLUME
WORK ASSIGNMENT No. D004436-11



APPENDIX 1

COST PROPOSAL

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

EARTH TECH NORTHEAST, INC.
TABLE 1.0
SUMMARY OF BUDGETED PROJECT COSTS

TASK	Direct Labor (a)	Indirect Costs 146.80%	Fixed Fee 10.5%	Travel & Subsistence(b)	Other Direct Costs(c)	Fixed Fee (d) Subcontractor	Sub Con Management Fee 5%	Unit Price (e) Subcontractor	TOTAL COLUMNS (1A-5)
Task 1 - Work Plan Development	$2,483	$3,646	$644	$42	$142	$0	$0	$0	$6,957
Task 2 - Field Investigation	$4,762	$6,990	$1,234	$395	$3,802	$0	$1,309	$34,637	$53,129
Task 3 - Field Documentation & Reporting	$3,860	$5,667	$1,000	$0	$1,005	$0	$0	$0	$11,533
Sub Con Mgmt Rules MWBE always 5% Others 5% only when >10,000									
TOTALS	**$11,106**	**$16,303**	**$2,878**	**$437**	**$4,949**	**$0**	**$1,309**	**$34,637**	**$71,619**

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(a)
SUMMARY OF WORK ASSIGNMENT PRICE

1.	DIRECT SALARY COSTS (Schedules 2.10(a) and 2.11(b)	$11,106
2.	INDIRECT COSTS (Schedule 2.10(g))	$16,303
3.	DIRECT NON-SALARY COSTS (Schedules 2.10(d)(e)(f) and 2.11(c)(d)	$5,386

SUBCONTRACT COSTS
COST-PLUS-FIXED-FEE SUBCONTRACTS
(Schedule 2.10(e) and 2.11(e))

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	SUBCONTRACT PRICE
YEC, Inc. (MBE)		$0
4. TOTAL COST-PLUS-FIXED-FEE SUBCONTRACTS		$0

UNIT PRICE SUBCONTRACTS
(Schedule 2.10(f) and 2.11(f))

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	SUBCONTRACT PRICE
Hampton Clarke (WBE)	Laboratory services	$2,798
ZEBRA Environmental Corp.	Drilling Services	$15,651
Environmental Data Services (WBE/MBE)	Data Validation	$360
NAVEA	Geophysical Survey	$4,440
Cycle Chem	IDW Disposal	$4,015
Naik Consulting Group	Land Surveying	$7,373
Subcontract mgmt fee by Rule		$1,309
5. TOTAL UNIT PRICE SUBCONTRACTS		$35,946

6.	TOTAL SUBCONTRACT COSTS (Lines 4 + 5)	$35,946
7.	FIXED FEE (Schedule 2.10(h))	$2,878
8.	TOTAL WORK ASSIGNMENT PRICE (Lines 1 + 2+ 3+ 6 + 7)	**$71,619**

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
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Site Name: Jung Sun Laundry Plume
Project No: 101962
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EARTH TECH NORTHEAST, INC.
NSPE
SCHEDULE 2.11(b)
DIRECT LABOR HOURS BUDGETED
2007

LABOR CLASSIFICATION AVERAGE RAW LABOR RATE	IX $63.67	VIII $62.25	VII $46.60	VI $41.84	V $37.36	IV $30.36	III $27.20	II $24.02	I $16.55	LABOR HOURS	DIRECT LABOR
Task 1 - Work Plan Development	1.00	12		36.00	3.00		2.00			54.00	$2,483.39
Task 2 - Field Investigation										0.00	$0.00
Task 3 - Field Documentation & Reporting										0.00	$0.00
TOTAL LABOR HOURS	1.00	12.00	0.00	36.00	3.00	0.00	2.00	0.00	0.00	54.00	$2,483.39
TOTAL LABOR DOLLARS	$63.67	$747.00	$0.00	$1,506.24	$112.08	$0.00	$54.40	$0.00	$0.00		$2,483.39

Work Assignment No: D004436-11
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Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

EARTH TECH NORTHEAST, INC.
NSPE
SCHEDULE 2.11(b)
DIRECT LABOR HOURS BUDGETED
2008

LABOR CLASSIFICATION AVERAGE RAW LABOR RATE	IX $65.58	VIII $64.12	VII $48.00	VI $43.10	V $38.48	IV $31.27	III $28.02	II $24.74	I $17.05	LABOR HOURS	DIRECT LABOR
Task 1 - Work Plan Development										0.00	$0.00
Task 2 - Field Investigation	1.00	4.00		16.00	96.00		2.00			119.00	$4,761.76
Task 3 - Field Documentation & Reporting	2.00	16.00		40.00	24.00		2.00			84.00	$3,860.42
TOTAL LABOR HOURS	3.00	20.00	0.00	56.00	120.00	0.00	4.00	0.00	0.00	203.00	$8,622.18
TOTAL LABOR DOLLARS	$196.74	$1,282.35	$0.00	$2,413.33	$4,617.70	$0.00	$112.06	$0.00	$0.00		$8,622.18

Work Assignment No: D004436-11
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Site Name: Jung Sun Laundry Plume
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Date Prepared: 12/14//07

EARTH TECH NORTHEAST, INC.
NSPE
SCHEDULE 2.11(b)
DIRECT LABOR HOURS BUDGETED
TOTAL

LABOR CLASSIFICATION	IX	VIII	VII	VI	V	IV	III	II	I	LABOR HOURS	DIRECT LABOR
Task 1 - Work Plan Development	1.00	12.00	0.00	36.00	3.00	0.00	2.00	0.00	0.00	54.00	$2,483.39
Task 2 - Field Investigation	1.00	4.00	0.00	16.00	96.00	0.00	2.00	0.00	0.00	119.00	$4,761.76
Task 3 - Field Documentation & Reporting	2.00	16.00	0.00	40.00	24.00	0.00	2.00	0.00	0.00	84.00	$3,860.42
TOTAL LABOR HOURS	4.00	32.00	0.00	92.00	123.00	0.00	6.00	0.00	0.00	257.00	$11,105.57
TOTAL LABOR DOLLARS	$260.41	$2,029.35	$0.00	$3,919.57	$4,729.78	$0.00	$166.46	$0.00	$0.00		$11,105.57

Work Assignment No: D004436-11
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EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(c)
DIRECT NON-SALARY COSTS

ITEM	MAXIMUM REIMBURSEMENT RATE	UNIT	ESTIMATED NUMBER OF UNITS	TOTAL ESTIMATED COST
In House Costs (ODC)				
Task 1				
Level D Equipment	$15.00	Day	1	$15.00
Printing B&W Cost (8.5 x 11)	$0.03	Page	900	$27.00
Printing Color Cost (11 x 17)	$1.00	Page	100	$100.00
Task 2				
Level D Equipment	$15.00	Day	10	$150.00
Low Value Equipment	$0.80	Hr	80	$64.00
Well Permits	$300.00	ea	2	$600.00
Sidewalk Permits	$380.00	ea	2	$760.00
Task 3				
Printing B&W Cost (8.5 x 11)	$0.03	Page	6,000	$180.00
Printing Color Cost (11 x 17)	$1.00	Page	500	$500.00
EDR Report	$325.00	Report	1	$325.00
			Total:	**$2,721.00**
Truck Mileage/Tolls				
Task 1				
Mileage	$0.485	Miles	50	$24.25
Toll	$18.000	Trip	1	$18.00
Task 2				
Mileage	$0.485	Miles	480	$232.80
Toll	$18.000	Trip	9	$162.00
Task 3				
Mileage	$0.485	Miles	0	$0.00
Toll	$18.000	Trip	0	$0.00
			Total:	**$437.05**

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EARTH TECH OF NEW YORK, INC.
SCHEDULE 2.11(d)3
Vendor Rented Equipment

ITEM	ESTIMATED QUANTITY		UNIT COST	TOTAL BUDGET COST
ODC				
Task 1				
Task 2				$0.00
Rental Van	3	Day	$110.00	$330.00
Water Level Indicator	4	Day	$20.00	$80.00
QED Bladder Pump, Controller and Compressor	2	Day	$100.00	$200.00
Replacement Kit	7	Kit	$20.00	$140.00
Battery boster pack	4	Unit	$8.00	$32.00
Horiba Water Quality Meter W/Flow thru Cell	3	Day	$100.00	$300.00
Oil-Water Interface probe	1	Day	$50.00	$50.00
mini RAE Photo Ionization Detector	3	Day	$65.00	$195.00
Teflon lined poly tubing (100 ft)	2	Roll	$140.00	$280.00
Poly Tubing (100 ft)	2	Roll	$22.00	$44.00
Encore Samplers	8	Roll	$9.00	$72.00
Task 3				
			Total:	**$1,723.00**

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EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(d)4
SITE-DEDICATED EQUIPMENT

ITEM	ESTIMATED QUANTITY	UNIT COST	TOTAL BUDGET COST
ODC			
Task 1			$0.00
Task 2			
Field Notebook	1	$15.00	$15.00
Task 3			$0.00
		Total:	**$15.00**

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EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(d)5
CONSUMABLE SUPPLIES

ITEM	ESTIMATED QUANTITY		UNIT COST	TOTAL BUDGET COST
ODC				
Supplies				
Task 1				
				$0.00
Task 2				
Ziploc Bags	4	Box	$0.99	$3.96
Towels, Paper	4	Roll	$0.99	$3.96
Bailer Cord	1	Roll	$4.00	$4.00
Teflon Bailers	1	Box	$190.00	$190.00
Poly Tubing	12	100 ft. roll	$22.00	$264.00
Ice	6	Bag	$4.00	$24.00
Task 3				
				$0.00
Services				
Task 1				
				$0.00
Task 2				
				$0.00
Task 3				
				$0.00
Task 4				
				$0.00
			Total:	**$489.92**

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EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(f)1
UNIT PRICE SUBCONTRACTS

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	WMBE Mngnt Fee	MWBE Flag (Y=1, N=0)	SUBCONTRACT PRICE
Hampton Clarke (WBE)	Laboratory services	$139.90	1	$2,798.00

Item	Maximum Reimbursement Rate (Specify Unit)		Estimated No. of Units	MWBE Mngnt Fee 5%	Total Estimated Costs
Task 1					
None					$0.00
Task 2					
Soil - VOCs - 8260B	$81.00	per sample	8	$32.40	$648.00
VOCs - Groundwater - 8260B - low conc	$125.00	per sample	12	$75.00	$1,500.00
Soil - TCLP VOCs	$650.00	per sample	1	$32.50	$650.00
Task 3					
None					$0.00
	Notes:				
	1 - Category B deliverables for all analyses				
	2 - TAT Surcharge not applied to rental				
	3 - WMBE Mgmt fee applicable to all costs				
	4 - Quantities inlcude QA; see QAPP Table 2.				
Sub Con Mgmt Rules					
MWBE always 5%					
Others 5% only when >10,000				$139.90	$2,798.00

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(f)2
UNIT PRICE SUBCONTRACTS

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	WMBE Mngnt Fee	MWBE Flag (Y=1, N=0)	SUBCONTRACT PRICE
ZEBRA Environmental Corp	Drilling Services	$782.55	0	$15,651.00

Item	Maximum Reimbursement Rate (Specify Unit)		Estimated No. of Units	MWBE Mngnt Fee 5%	Total Estimated Costs
Task 1					
None					$0.00
Task 2					
Geoprobe Op. & Unit	$1,425.00	Day	4	$285.00	$5,700.00
MIP Op. & Unit	$1,485.00	Day	2	$148.50	$2,970.00
MIP Project Setup Charge	$250.00	LS	1	$12.50	$250.00
MIP Logging	$2.90	ea.	240	$34.80	$696.00
Monitoring Point Installation	$375.00	LS	3	$56.25	$1,125.00
Drums	$45.00	ea.	5	$11.25	$225.00
Mob/Demob Geoprobe	$195.00	trip	5	$48.75	$975.00
Mob/Demob MIIP	$495.00	trip	1	$24.75	$495.00
Per Diem	$120.00	ea.	2	$12.00	$240.00
Vac Ex Unit	$1,375.00	Day	1	$68.75	$1,375.00
NYCDOT Permit Acquisition	$400.00	ea.	1	$20.00	$400.00
3-D Imaging	$75.00	point	16	$60.00	$1,200.00
Sub Con Mgmt Rules					
MWBE always 5%					
Others 5% only when >10,000				$782.55	$15,651.00

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(f)3
UNIT PRICE SUBCONTRACTS

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	WMBE Mngnt Fee	MWBE Flag (Y=1, N=0)	SUBCONTRACT PRICE
Environmental Data Services (WBE/MBE)	Data Validation	$18.00	1	$360.00

Item	Maximum Reimbursement Rate (Specify Unit)	Estimated No. of Units	MWBE Mngnt Fee 5%	Total Estimated Costs
Task 1				
None				$0.00
Task 2				
Soil VOCs - 8260B	$18.00 per sample	8	$7.20	$144.00
Groundwater - VOCs - low conc	$18.00 per sample	12	$10.80	$216.00
Task 3				
None				
Sub Con Mgmt Rules				
MWBE always 5%				
Others 5% only when >10,000			$18.00	$360.00

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(f)4
UNIT PRICE SUBCONTRACTS

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	WMBE Mngnt Fee	MWBE Flag (Y=1, N=0)	SUBCONTRACT PRICE
NAVEA	Geophysical Survey	$0.00	0	$4,440.00

Item	Maximum Reimbursem Rate (Specify Unit)		Estimated No. of Units	MWBE Mngnt Fee 5%	Total Estimated Costs
Task 1					
None					$0.00
Task 2					
Labor	$225.00	HR	12	$0.00	$2,700.00
travel	$210.00	HR	4	$0.00	$840.00
GPR	$175.00	HR	1	$0.00	$175.00
Report prepare	$100.00	HR	1	$0.00	$100.00
Materials charge	$125.00	LS	1	$0.00	$125.00
Downhole camera equipment	$500.00	Day	1	$0.00	$500.00
Task 3					
None					$0.00
Sub Con Mgmt Rules					
MWBE always 5%					
Others 5% only when >10,000				$0.00	$4,440.00

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(f)5
UNIT PRICE SUBCONTRACTS

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	WMBE Mngnt Fee	MWBE Flag (Y=1, N=0)	SUBCONTRACT PRICE
Cycle Chem	IDW Disposal	$0.00	0	$4,015.02

Item	Maximum Reimbursement Rate (Specify Unit)	Estimated No. of Units	MWBE Mngnt Fee 5%	Total Estimated Costs
Task 1			$0.00	$0.00
Task 2				
Groundwater	$149.00 55G Drums	4	$0.00	$596.00
Soil	$299.00 55G Drums	1	$0.00	$299.00
Estimated Disposal Cost			$0.00	$895.00
Manifest Preparation	$25.00 ea.	5	$0.00	$125.00
Label Preparation	$35.00 ea.	5	$0.00	$175.00
QA/QC Fee	$40.00 ea.	5	$0.00	$200.00
Regulatory Administrative Fee	5%		$0.00	$69.75
Transportation	$350.00 load	5	$0.00	$1,750.00
Fuel Surcharge	28%		$0.00	$490.00
Tax	8.375%		$0.00	$310.27
Task 3			$0.00	$0.00
Sub Con Mgmt Rules MWBE always 5% Others 5% only when >10,000			$0.00	$4,015.02

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

EARTH TECH NORTHEAST, INC.
SCHEDULE 2.11(f)6
UNIT PRICE SUBCONTRACTS

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	WMBE Mngnt Fee	MWBE Flag (Y=1, N=0)	SUBCONTRACT PRICE
Naik Consulting Group	Land Surveying	$368.65	1	$7,373.03

Item	Maximum Reimbursement Rate (Specify Unit)	Estimated No. of Units	MWBE Mngnt Fee 5%	Total Estimated Costs
Task 1			$0.00	$0.00
Task 2				
Labor	$2,638.00 ea.	1	$131.90	$2,638.00
Overhead (131%)	$3,455.78 ea.	1	$172.79	$3,455.78
Fee (12%)	$731.25 ea.	1	$36.56	$731.25
Parking, Tolls, Mailings	$200.00 ea.	1	$10.00	$200.00
Supplemental Benefit	$348.00 ea.	1	$17.40	$348.00
Differential Field Survey Personnel				
Task 3			$0.00	$0.00
Sub Con Mgmt Rules MWBE always 5% Others 5% only when >10,000			$368.65	$7,373.03

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

SCHEDULE 2.11(g)
MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Total Assignment

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+C)	E Estimated Costs To Completion	F Estimated Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1 Direct Salary Costs							$11,105.57	
2 Indirect Costs (146.8%)							$16,302.98	
3 Subtotal Direct Salary Costs and Indirect Costs							$27,408.55	
4 Travel							$437.05	
5 Other Non-Salary Costs							$4,948.92	
6 Subtotal Direct Non-Salary Costs							$5,385.97	
7 Subcontractors							$34,637.05	
8 Total Work Assignment Cost							$67,431.57	
9 Fixed Fee (10.5%)							$2,877.90	
9A Subcon. Mgmt. Fee							$1,309.10	
10 Total Work Assignment Price							**$71,618.57**	

Project Manager (Engineer) _____ Date _____

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

SCHEDULE 2.11(g)
MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Task 1 - Work Plan Development

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+C)	E Estimated Costs To Completion	F Estimated Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1 Direct Salary Costs							$2,483.39	
2 Indirect Costs (146.8%)							$3,645.62	
3 Subtotal Direct Salary Costs and Indirect Costs							$6,129.01	
4 Travel							$42.25	
5 Other Non-Salary Costs							$142.00	
6 Subtotal Direct Non-Salary Costs							$184.25	
7 Subcontractors							$0.00	
8 Total Work Assignment Cost							$6,313.26	
9 Fixed Fee (10.5%)							$643.55	
9A Subcon. Mgmt. Fee							$0.00	
10 Total Work Assignment Price							**$6,956.81**	

Project Manager (Engineer) _____ Date _____

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

SCHEDULE 2.11(g)
MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Task 2 - Field Investigation

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+C)	E Estimated Costs To Completion	F Estimated Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1 Direct Salary Costs							$4,761.76	
2 Indirect Costs (146.8%)							$6,990.26	
3 Subtotal Direct Salary Costs and Indirect Costs							$11,752.02	
4 Travel							$394.80	
5 Other Non-Salary Costs							$3,801.92	
6 Subtotal Direct Non-Salary Costs							$4,196.72	
7 Subcontractors							$34,637.05	
8 Total Work Assignment Cost							$50,585.79	
9 Fixed Fee (10.5%)							$1,233.96	
9A Subcon. Mgmt. Fee							$1,309.10	
10 Total Work Assignment Price							**$53,128.85**	

Project Manager (Engineer) _____ Date _____

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

SCHEDULE 2.11(g)
MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Task 3 - Field Documentation & Reporting

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+C)	E Estimated Costs To Completion	F Estimated Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1 Direct Salary Costs							$3,860.42	
2 Indirect Costs (146.8%)							$5,667.10	
3 Subtotal Direct Salary Costs and Indirect Costs							$9,527.52	
4 Travel							$0.00	
5 Other Non-Salary Costs							$1,005.00	
6 Subtotal Direct Non-Salary Costs							$1,005.00	
7 Subcontractors							$0.00	
8 Total Work Assignment Cost							$10,532.52	
9 Fixed Fee (10.5%)							$1,000.39	
9A Subcon. Mgmt. Fee							$0.00	
10 Total Work Assignment Price							**$11,532.91**	

Project Manager (Engineer) _____ Date _____

Work Assignment No: D004436-11
Engineer: Earth Tech Northeast, Inc.
Site ID No: 241102

Site Name: Jung Sun Laundry Plume
Project No: 101962
Date Prepared: 12/14//07

MONTHLY COST CONTROL REPORT
SCHEDULE 2.11(h)
SUMMARY OF LABOR HOURS
NUMBER OF DIRECT LABOR HOURS EXPENDED TO DATE/ ESTIMATED NUMBER OF DIRECT LABOR HOURS TO COMPLETION

LABOR CLASS	IX		VIII		VII		VI		V		IV		III		II		I		TOTAL NO. OF DIRECT LABOR HOURS	
TASK NO.	Exp	Est.	Exp	Est.	Exp	Est.	Exp	Est.	Exp	Est.	Exp	Est.	Exp	Est.	Exp	Est.	Exp	Est.	Exp	Est.
1		1.0		12.0		0.0		36.0		3.0		0.0		2.0		0.0		0.0		54.0
2		1.0		4.0		0.0		16.0		96.0		0.0		2.0		0.0		0.0		119.0
3		2.0		16.0		0.0		40.0		24.0		0.0		2.0		0.0		0.0		84.0
4		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
5		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
6		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
7		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
8		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
9		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
10		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
11		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
12		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
13		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
14		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
15		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
16		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
17		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
TOTAL		4.0		32.0		0.0		92.0		123.0		0.0		6.0		0.0		0.0		257.0

ATTACHMENT A
FIELD ACTIVITIES PLAN

SITE CHARACTERIZATION
JUNG SUN LAUNDRY PLUME
Site Number: 241102

Work Assignment No.
D004436-11

Prepared for:

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
625 Broadway
Albany, New York 12233

December 2007

Prepared by:

Earth Tech Northeast, Inc.
300 Broadacres Drive
Bloomfield, NJ 07003-3153

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FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 PURPOSE OF THE WORK ASSIGNMENT

The purpose of this Field Activities Plan (FAP), Attachment A to the Work Plan, is to describe activities planned for the field sampling and related activities portions of the site investigation at the Jung Sun Laundry Plume site (hereafter referred to as the "site"). The work will be performed in accordance with NYSDEC Division of Environmental Remediation Draft DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2002) and the scope of work specified by the NYSDEC remedial project manager.

The work described in this FAP is being performed under the Earth Tech Northeast, Inc. (Earth Tech) NYSDEC Superfund Standby Contract Work Assignment No. D004436-11. The FAP provides the detailed procedures for the collection of environmental samples.

The quality assurance protocols applicable to this project are presented in the Quality Assurance Project Plan (QAPP), provided as Attachment B to the work plan. The health and safety plan (HASP) is provided as Attachment C, and the Community Air Monitoring Plan is provided as Attachment D to the Work Plan.

The specific objectives of this project are to gather information to identify the source of the volatile organic contamination in the groundwater, determine environmental sampling needs and determine whether the site should be reclassified or nominated the site to the NPL.

1.2 SITE DESCRIPTION

The Jung Sun Laundry Plume site (herein identified as the "site") is located at 37-10 24th Street, Long Island City, Queens, New York. Jung Sun Laundry has been in operation since the 1930s. From the late 1980s to the mid 1990s, the site was operated as a dry cleaner. The site then transitioned from dry cleaning back to laundry service. The site is currently operating as a laundry on a seven day a week, 14-hour a day schedule. Scalamandre Silks is adjacent to this site. Textile fabric manufacturing has been performed on this property since 1936. Scalamandre Silks manufacturing facility has been in operation since the 1950s. Based on site use, it is likely that chemical dyes, paints, solvents and softening agents were used historically as part of day-to-day operations.

1.3 SITE ACCESS

NYSDEC will obtain permission from the current owners of the site and adjacent property for the installation of borings, monitoring wells and groundwater sampling. Two of the monitoring wells are on the right-of-way. A Site Contact List is provided below.

Name	Title/Workstation	Telephone Number	Mobile Phone
Sadique Ahmed	NYSDEC Project Manager/ Client Contact	(518) 402-9775 (Office)	
Claire Hunt	Project Manager	(973) 337-4216 (Office)	
Celeste Foster	Site Supervisor/SSHO	(973) 337-4209 (Office)	(646) 729-5784
Robert Poll, CIH	Safety and Health Manager	(518) 951-2200 (Office)	(518) 817-3089
Mike Thiagaram	Primary Emergency Coordinator	(973) 337-4242 (Office)	

2.0 GENERAL FIELD ACTIVITIES

General field activities include mobilization, implementing the site health and safety plan (included in Attachment C), implementing the community air monitoring plan (Attachment D), decontamination procedures and handling of investigation derived waste and a site survey. The QAPP is presented as Attachment B to the Work Plan

2.1 MOBILIZATION

Following authorization to proceed with the field investigation from NYSDEC, Earth Tech will mobilize necessary materials and equipment to the site.

A project kick-off meeting will be held prior to initiating field work to orient field team members and subcontractors with the Site and to familiarize Earth Tech personnel and our subcontractor personnel with site background, scope of work, potential dangers, health and safety requirements, emergency contingencies and other field procedures.

2.2 HEALTH AND SAFETY

It is anticipated that the work to be completed at the Site will be performed in level D personal protection. See Attachment C for the HASP.

2.3 COMMUNITY AIR MONITORING

Community air monitoring will be performed as outlined in Attachment D, Community Air Monitoring Plan.

2.4 SITE SURVEY

The locations of all sample points and existing monitoring wells will be surveyed by a subcontractor. The horizontal and vertical positions will be tied in to the North American Datum 1983 and UTM Zone 18N coordinate system. The subcontractor will provide a detailed topographic base map of the site and immediate vicinity will be developed. Contours will be plotted at 1 ft intervals. Tax maps will be reviewed and the property lines of the parcel will be placed on the base map. All elevations will be referenced to the North American Vertical Datum (NAVD) 88 and horizontal locations will be referenced to the North American Datum (NAD 83).

The survey will be conducted in a single effort, at the conclusion of the field work associated with Task 2 (Geophysical/Field Investigation) of this Site Characterization.

3.0 GEOPHYSICAL SURVEY/FIELD INVESTIGATION

The activities to be performed under this task will involve the evaluation of the media at the site to determine the source of historical contamination (VOCs) identified in the vicinity of the site. This section outlines the procedures that will be used in the field investigation.

3.1 GEOPHSYICAL SURVEY (UTILITY CLEARANCE)

Prior to the initiation of subsurface borings or penetrations, a utility markout will be ordered by the contractor performing the penetrations or borings.

In addition to the utility mark out service, Earth Tech will oversee a ground penetrating radar survey to get clearance for the boring and monitoring well locations to verify that no underground utilities are impacted by the subsurface investigations.

3.2 MEMBRANE INTERFACE PROBE (MIP)

Borings will be advanced at up to 16 locations for the MIP survey. The contractor will follow a standard operating procedure that is consistent with the Geoprobe Membrane Interphase Probe (MIP) Standard Operating Procedure, Technical Bulleting No. MD3010, May 2003. The proposed locations are provided in Figure 1. The sampling locations maybe adjusted in the field to account for obstructions or to improve the delineation. Soil samples may be collected at up to four of the borings advanced for the MIP survey (see Section 3.6, below).

3.3 MONITORING WELL INSTALLATION

Three monitoring wells will be installed utilizing direct push (e.g., geoprobe) drilling methods. Earth Tech will observe the installation at each location. Each monitoring point will consist of 10 ft of 2-inch diameter pre-packed PVC screen and 2-inch ID riser. The depth of the screened interval will be determined in the field. The screen will be located to capture shallow groundwater, which typically begins 15 feet bgs. A minimum 2-ft thick bentonite seal will then be placed above the filter pack. The remaining borehole will be filled to just below ground surface with a bentonite/cement grout. A flush-mounted well cover will be installed in a cement pad at ground surface. A well development form is provided in Appendix 1.

Soil cuttings generated from the boreholes will be logged and documented by a geologist. Notes will be kept in both bound field books and boring logs. The Unified Soils Classification System will be used to describe the soil. Cuttings will also be screened for VOCs using an organic vapor analyzer equipped with a photoionization detector (PID).

Soil samples may be collected at some or all three of the new monitoring well locations (based on VOC readings above background levels).

3.4 WATER LEVEL SURVEY

Immediately prior to the groundwater sampling, the depth to water in the eight monitoring wells will be gauged to provide information on groundwater flow in the vicinity of the site. Water level measurements will be recorded in the field notebook and on the form included in Appendix 1 (Field Forms) of this FAP. Based on field measurements and an established survey datum, Earth Tech will generate a groundwater elevation contour map.

3.5 GROUNDWATER SAMPLING

Approximately 14 days after the installation and development of the proposed monitoring wells, an initial round of groundwater samples will be collected from the three new monitoring wells and five existing monitoring wells: MW-1, MW-2, MW-3, MW-4, and MW-5.

Monitoring wells will be purged via low flow sampling methods (in low yield wells, the sample may be collected after well recharges if purged dry) as outlined in Appendix 2 of this FAP. These forms include purge logs which will provide details on the groundwater conditions prior to sampling.

Purged water will be drummed for proper off-site disposal and/or treatment during well development and sampling.

3.6 SOIL SAMPLE COLLECTION

Soil samples will be collected at up to four locations if elevated levels of VOCs are observed during the MIP investigation. Soil samples will be collected at up to three locations if elevated PID levels are observed during the monitoring well installation. The soil samples will be analyzed for VOCs.

The soil samples will be collected using a 4-ft-long dedicated acetate liner. The acetate liner will be opened upon retrieving the sampler. The soil retained in the sampler will be visually evaluated and will also be screened for organic vapors with a photoionization detector (PID).

The soil samples will be collected from a 6-inch interval having high elevated PID reading. Samples for VOCs will be collected with EnCore samplers.

3.7 ANALYSES OF ENVIRONMENTAL SAMPLES

The soil samples will be analyzed for VOCs. Further detail on the analytical requirements is provided in the QAPP (Attachment B).

Groundwater samples will be analyzed for volatile organic compounds (VOCs) by EPA Method 8260. The analytical samples required are summarized in Table 2 of the QAPP (Work Plan Attachment B); with further detail on the analytical requirement provided in the QAPP.

Preliminary sample results will be provided in two weeks and final sample results will be provided within standard turnaround time (30 days).

4.0 FIELD EQUIPMENT CALIBRATION AND MAINTENANCE

Field testing of groundwater will be performed during purging of wells prior to sampling for laboratory samples. Field QC checks of control limits for pH, specific conductance (conductivity), temperature and turbidity are detailed below. The calibration frequencies discussed below are the minimum. Field personnel can and should check calibration more frequently in adverse conditions, if anomalous readings are obtained, or subjective observations of instrument performance suggest the possibility of erroneous readings.

4.1 PH METER

The pH meter will be calibrated each morning prior to initial use, using two standards bracketing the range of interest (generally 4.0 and 7.0). If the pH QC control sample (a pH buffer, which may be the same or different than those used to initially calibrate the instrument) exceeds ±0.1 pH units from the true value, the source of the error will be determined and the instrument recalibrated. If a continuing calibration check with pH 7.0 buffer is off by ±0.1 pH units, the instrument will be recalibrated. Expired buffer solutions will not be used.

Note that gel-type probes take longer to equilibrate (up to 15 minutes at near-freezing temperatures); this must be taken into account in calibrating the instrument and reading samples and standards.

4.2 SPECIFIC CONDUCTIVITY

A vendor-provided conductivity standard will be used to check the calibration of the conductivity meter each morning prior to initial use. Specific conductance QC samples will be on the order of 0.01 or 0.1 molar potassium chloride solutions in accordance with manufacturer's recommendations.

4.3 TURBIDITY

The turbidity meter will be calibrated using a standard as close as possible to 50 nephelometric turbidity units (NTU) (the critical value for determining effectiveness of well development and evacuation). The turbidity meter will be calibrated and checked prior to initial use. The turbidity QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar).

4.4 TEMPERATURE

Temperature probes associated with instruments (such as the YSI SCT-33 conductivity and temperature meter) are not subject to field calibration, but the calibration should be checked to monitor instrument performance. It is recommended that the instrument's temperature reading be checked against a NBS-traceable thermometer concurrently with checking the conductivity calibration. The instrument manual will be referenced for corrective actions if accurate readings cannot be obtained.

5.0 SAMPLE IDENTIFICATION, NUMBERING, AND LABELING

Groundwater samples will be identified by the monitoring well number from which they are collected (e.g., MW-2). New monitoring wells will be numbered MW-6, MW-7, and MW-8.

MIP boring locations will be identified as MP-1 through MP-16.

Soil samples will be identified with the soil boring from which they are collected and a six-digit depth interval in feet, with a "SB" prefix. For example, a soil sample from the 6 to 6.5 ft bgs interval at the boring for MP-1 will be identified as SBMP-1-060065.

Field duplicates will have the same number as the original sample, with 50 added. For example, the field duplicate of MW-6 will be labeled as MW-56.

Trip blanks will be identified as "TB" followed by a six-digit date code indicating the date of shipment. For example, the trip blank shipped on December 14, 2007 will be labeled TB121407.

Field (rinsate) blanks will be identified as "FB" followed by a matrix code ("SB" for soil boring field blanks, and "GW" for groundwater field blanks) and the six-digit date code.

Pre-printed sample labels will be provided by the laboratory along with the sample containers. Sample labels will be completed and will, as a minimum, include the sample ID and date of sample. Labels are not placed directly on the EnCore samplers but are placed on the outside of the plastic bag in which the Encore sampler is shipped.

6.0 EQUIPMENT DECONTAMINATION AND IDW DISPOSAL

Where possible, equipment will be dedicated and pre-cleaned by the vendor (EnCore samplers for VOCs; acetate liners for collection of soil samples from direct push borings).

All non-dedicated hand equipment and tools will be decontaminated using the following procedures:

- Scrub/wash with a laboratory grade detergent (e.g., alconox);
- Tap water rinse or distilled/de-ionized water rinse;
- Distilled/de-ionized water rinse.

If equipment is to be stored for future use, it will be allowed to air dry, and then wrapped in aluminum foil or sealed in plastic bags.

General trash generated during the investigation (e.g., packaging materials, personal protective equipment which is not grossly contaminated) will be bagged and disposed as ordinary solid waste.

Soil cuttings and purge water (during well development and sampling) will be drummed; drums will be provided by the boring contractor. IDW will be tested and disposed off-site.

Decontamination fluid will be discharged directly to the ground away from any surface water.

IDW will be picked up daily.

7.0 FIELD DOCUMENTATION

Field notebooks will be initiated at the start of on-site work. The field notebook will include the following daily information for all site activities (except that information that is recorded on standard forms need not be repeated in the log book):

- Date;
- Meteorological conditions (temperature, wind, precipitation);
- Site conditions (e.g., dry, damp, dusty, etc.);
- Identification of crew members (Earth Tech and subcontractor present) and other personnel (e.g., agency or site owner) present;
- Description of field activities;
- Location(s) where work is performed;
- Problems encountered and corrective actions taken;
- Records of field measurements or descriptions recorded; and
- Notice of modifications to the scope of work.

- The field sampler will note and record any odors emanating from the groundwater when purging and sampling.

During sampling of wells, field samplers will add the following:

- Sampling point locations and test results such as pH, conductance, etc.;
- Information about sample collection (e.g., duplicate sample location);
- Chain of custody information; and
- Field equipment calibration.

Field Forms will be used to standardize data collection and documentation, including the following:

- Soil boring logs, which include location, soil classification, PID measurements, soil sample locations (intervals), moisture, color, etc., for each borehole location;
- Well construction logs will be provided for monitoring wells;
- Purge logs will be provided for groundwater sample collection; and
- A photo log will be developed that documents site conditions, sampling procedures, etc.

Except for the photo log, copies of the field forms are provided in Appendix 1 to the FAP.

8.0 SITE CHARACTERIZATION REPORT

Subsequent to the completion of the site investigation and receipt of the data, Earth Tech will submit a site characterization report, as described in greater detail in the Work Plan (Section 2.3.3).

EARTH TECH

- Existing Monitoring Well
- Planned Monitoring Well
- x MIP Boring Location
- A Area will need to be clear during the geophysical survey, drilling, and land survey in these areas.

Project:
Jung Sun Laundry Plume
37-10 24th Street
Long Island City, Queens, NY

Figure 1 – Sample Locations

APPENDIX 1

Field Sampling Forms

EarthTech

A tyco International Ltd. Company

WELL NO.

WELL DEVELOPMENT FORM	PROJECT	PROJECT No.	SHEET SHEETS OF
1. LOCATION	4. DATE WELL STARTED		5. DATE WELL COMPLETED
2. CLIENT	6. NAME OF INSPECTOR		
3. DRILLING COMPANY	7. SIGNATURE OF INSPECTOR		

ONE WELL VOLUME : WELL TD:

Time	Depth to Water (ft)	Purge Rate (ml/min)	FIELD MEASUREMENTS						REMARKS
			Temp. (C)	Conduct. (ms/cm)	DO (mg/L)	pH	ORP (mV)	Turbidity (ntu)	

Pump Type:

Analytical Parameters:

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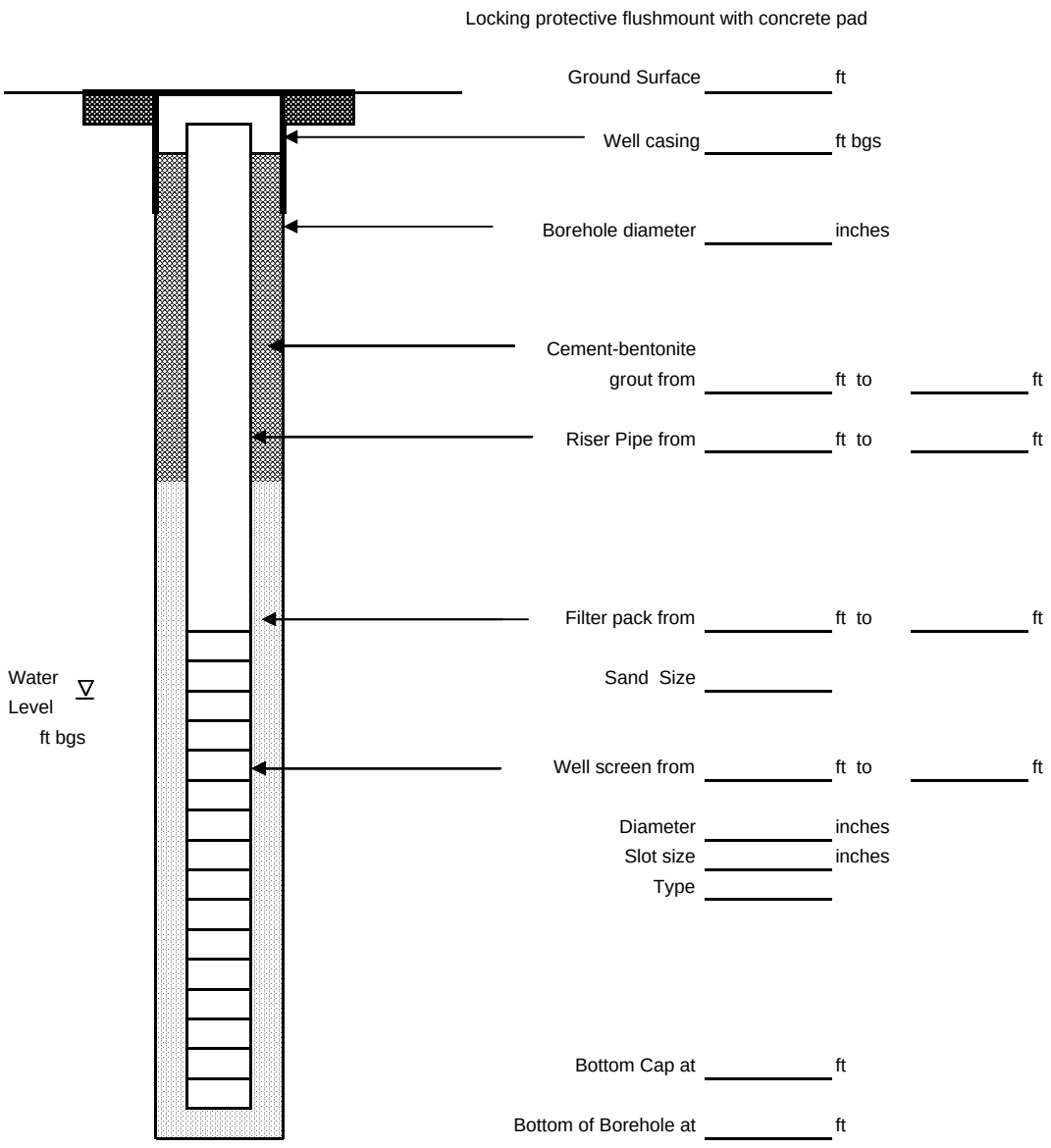
Well No.

Project:	Location:	Page 1 of 1		
Earth Tech Project No.:	Subcontractor:	Water Levels		
Surface Elevation: Ft	Driller:	Date	Time	Depth
Top of PVC Casing Elevation: 74.18 Ft	Well Permit No.: N/A			
	Earth Tech Rep.:			
Datum: NGVD 1988	Date of Completion:			



Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

(NOT TO SCALE)

EarthTech
A Tyco International Ltd. Company

DIRECT PUSH BORING LOG

Boring No.:

PROJECT:				PAGE 1 OF 1
PROJECT No.:			CONTRACTOR:	DATE:
LOCATION:			DRILLERS NAME:	ET REP.:
WATER LEVELS			DESIGNATION OF DRILL RIG:	
DATE	TIME	DEPTH	SIZE AND TYPE OF EQUIPMENT:	
			REFERENCE ELEVATION: GS	DEPTH OF BOREHOLE:
LABORATORY ANALYSES:				

Depth (ft)	Sample Number &Time	Rec. (feet)	PID Readings (ppm)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

APPENDIX 2

Low-Flow Sampling Guidance

United States Environmental Protection Agency | Office of Research and Development | Office of Solid Waste and Emergency Response | EPA/540/S-95/504 April 1996

Ground Water Issue

LOW-FLOW (MINIMAL DRAWDOWN) GROUND-WATER SAMPLING PROCEDURES

by Robert W. Puls[1] and Michael J. Barcelona[2]

Background

The Regional Superfund Ground Water Forum is a group of ground-water scientists, representing EPA's Regional Superfund Offices, organized to exchange information related to ground-water remediation at Superfund sites. One of the major concerns of the Forum is the sampling of ground water to support site assessment and remedial performance monitoring objectives. This paper is intended to provide background information on the development of low-flow sampling procedures and its application under a variety of hydrogeologic settings. It is hoped that the paper will support the production of standard operating procedures for use by EPA Regional personnel and other environmental professionals engaged in ground-water sampling.

For further information contact: Robert Puls, 405-436-8543, Subsurface Remediation and Protection Division, NRMRL, Ada, Oklahoma.

I. Introduction

The methods and objectives of ground-water sampling to assess water quality have evolved over time. Initially the emphasis was on the assessment of water quality of aquifers as sources of drinking water. Large water-bearing units were identified and sampled in keeping with that objective. These were highly productive aquifers that supplied drinking water via private wells or through public water supply systems. Gradually, with the increasing awareness of subsurface pollution of these water resources, the understanding of complex hydrogeochemical processes which govern the fate and transport of contaminants in the subsurface increased. This increase in understanding was also due to advances in a number of scientific disciplines and improvements in tools used for site characterization and ground-water sampling. Ground-water quality investigations where pollution was detected initially borrowed ideas, methods, and materials for site characterization from the water supply field and water analysis from public health practices. This included the materials and manner in which monitoring wells were installed and the way in which water was brought to the surface, treated, preserved and analyzed. The prevailing conceptual ideas included convenient generalizations of ground-water resources in terms of large and relatively homogeneous hydrologic *units*. With time it became apparent that conventional water supply generalizations of *homogeneity* did not adequately represent field data regarding pollution of these subsurface resources. The important role of *heterogeneity* became increasingly clear not only in geologic terms, but also in terms of complex physical,

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Technology Innovation Office
Office of Solid Waste and Emergency Response, US EPA, Washington, DC

Walter W. Kovalick, Jr., Ph.D.
Director

chemical and biological subsurface processes. With greater appreciation of the role of heterogeneity, it became evident that subsurface pollution was ubiquitous and encompassed the unsaturated zone to the deep subsurface and included unconsolidated sediments, fractured rock, and *aquitards* or low-yielding or impermeable formations. Small-scale processes and heterogeneities were shown to be important in identifying contaminant distributions and in controlling water and contaminant flow paths.

It is beyond the scope of this paper to summarize all the advances in the field of ground-water quality investigations and remediation, but two particular issues have bearing on ground-water sampling today: aquifer heterogeneity and colloidal transport. Aquifer heterogeneities affect contaminant flow paths and include variations in geology, geochemistry, hydrology and microbiology. As methods and the tools available for subsurface investigations have become increasingly sophisticated and understanding of the subsurface environment has advanced, there is an awareness that in most cases a primary concern for site investigations is characterization of contaminant flow paths rather than entire aquifers. In fact, in many cases, plume thickness can be less than well screen lengths (e.g., 3-6 m) typically installed at hazardous waste sites to detect and monitor plume movement over time. Small-scale differences have increasingly been shown to be important and there is a general trend toward smaller diameter wells and shorter screens.

The hydrogeochemical significance of colloidal-size particles in subsurface systems has been realized during the past several years (Gschwend and Reynolds, 1987; McCarthy and Zachara, 1989; Puls, 1990; Ryan and Gschwend, 1990). This realization resulted from both field and laboratory studies that showed faster contaminant migration over greater distances and at higher concentrations than flow and transport model predictions would suggest (Buddemeier and Hunt, 1988; Enfield and Bengtsson, 1988; Penrose et al., 1990). Such models typically account for interaction between the mobile aqueous and immobile solid phases, but do not allow for a mobile, reactive solid phase. It is recognition of this third *phase* as a possible means of contaminant transport that has brought increasing attention to the manner in which samples are collected and processed for analysis (Puls et al., 1990; McCarthy and Degueldre, 1993; Backhus et al., 1993; U. S. EPA, 1995). If such a phase is present in sufficient mass, possesses high sorption reactivity, large surface area, and remains stable in suspension, it can serve as an important mechanism to facilitate contaminant transport in many types of subsurface systems.

Colloids are particles that are sufficiently small so that the surface free energy of the particle dominates the bulk free energy. Typically, in ground water, this includes particles with diameters between 1 and 1000 nm. The most commonly observed mobile particles include: secondary clay minerals; hydrous iron, aluminum, and manganese oxides; dissolved and particulate organic materials, and viruses and bacteria. These reactive particles have been shown to be mobile under a variety of conditions in both field studies and laboratory column experiments, and as such need to be included in monitoring programs where identification of the *total* mobile contaminant loading (dissolved + naturally suspended particles) at a site is an objective. To that end, sampling methodologies must be used which do not artificially bias *naturally* suspended particle concentrations.

Currently the most common ground-water purging and sampling methodology is to purge a well using bailers or high speed pumps to remove 3 to 5 casing volumes followed by sample collection. This method can cause adverse impacts on sample quality through collection of samples with high levels of turbidity. This results in the inclusion of otherwise immobile artifactual particles which produce an overestimation of certain analytes of interest (e.g., metals or hydrophobic organic compounds). Numerous documented problems associated with filtration (Danielsson, 1982; Laxen and Chandler, 1982; Horowitz et al., 1992) make this an undesirable method of rectifying the turbidity problem, and include the removal of potentially mobile (contaminant-associated) particles during filtration, thus artificially biasing contaminant concentrations low. Sampling-induced turbidity problems can often be mitigated by using low-flow purging and sampling techniques.

Current subsurface conceptual models have undergone considerable refinement due to the recent development and increased use of field screening tools. So-called hydraulic *push* technologies (e.g., cone penetrometer, Geoprobe®, QED HydroPunch®) enable relatively fast screening site characterization which can then be used to design and install a monitoring well network. Indeed, alternatives to conventional monitoring wells are now being considered for some hydrogeologic settings. The ultimate design of any monitoring system should however be based upon adequate site characterization and be consistent with established monitoring objectives.

If the sampling program objectives include accurate assessment of the magnitude and extent of subsurface contamination over time and/or accurate assessment of subsequent remedial performance, then some information regarding plume delineation in three-dimensional space is necessary prior to monitoring well network design and installation. This can be accomplished with a variety of different tools and equipment ranging from hand-operated augers to screening tools mentioned above and large drilling rigs. Detailed information on ground-water flow velocity, direction, and horizontal and vertical variability are essential baseline data requirements. Detailed soil and geologic data are required prior to and during the installation of sampling points. This includes historical as well as detailed soil and geologic logs which accumulate during the site investigation. The use of borehole geophysical techniques is also recommended. With this information (together with other site characterization data) and a clear understanding of sampling

objectives, then appropriate location, screen length, well diameter, slot size, etc. for the monitoring well network can be decided. This is especially critical for new in situ remedial approaches or natural attenuation assessments at hazardous waste sites.

In general, the overall goal of any ground-water sampling program is to collect water samples with no alteration in water chemistry; analytical data thus obtained may be used for a variety of specific monitoring programs depending on the regulatory requirements. The sampling methodology described in this paper assumes that the monitoring goal is to sample monitoring wells for the presence of contaminants and it is applicable whether mobile colloids are a concern or not and whether the analytes of concern are metals (and metalloids) or organic compounds.

II. Monitoring Objectives and Design Considerations

The following issues are important to consider prior to the design and implementation of any ground-water monitoring program, including those which anticipate using low-flow purging and sampling procedures.

A. Data Quality Objectives (DQOs)

Monitoring objectives include four main types: detection, assessment, corrective-action evaluation and resource evaluation, along with *hybrid* variations such as site-assessments for property transfers and water availability investigations. Monitoring objectives may change as contamination or water quality problems are discovered. However, there are a number of common components of monitoring programs which should be recognized as important regardless of initial objectives. These components include:

1) Development of a conceptual model that incorporates elements of the regional geology to the local geologic framework. The conceptual model development also includes initial site characterization efforts to identify hydrostratigraphic units and likely flow-paths using a minimum number of borings and well completions;

2) Cost-effective and well documented collection of high quality data utilizing simple, accurate, and reproducible techniques; and

3) Refinement of the conceptual model based on supplementary data collection and analysis.

These fundamental components serve many types of monitoring programs and provide a basis for future efforts that evolve in complexity and level of spatial detail as purposes and objectives expand. High quality, reproducible data collection is a common goal regardless of program objectives.

High quality data collection implies data of sufficient accuracy, precision, and completeness (i.e., ratio of valid analytical results to the minimum sample number called for by the program design) to meet the program objectives. Accuracy depends on the correct choice of monitoring tools and procedures to minimize sample and subsurface disturbance from collection to analysis. Precision depends on the repeatability of sampling and analytical protocols. It can be assured or improved by replication of sample analyses including blanks, field/lab standards and reference standards.

B. Sample Representativeness

An important goal of any monitoring program is collection of data that is truly representative of conditions at the site. The term *representativeness* applies to chemical and hydrogeologic data collected via wells, borings, piezometers, geophysical and soil gas measurements, lysimeters, and temporary sampling points. It involves a recognition of the statistical variability of individual subsurface physical properties, and contaminant or major ion concentration levels, while explaining extreme values. Subsurface temporal and spatial variability are facts. Good professional practice seeks to maximize representativeness by using proven accurate and reproducible techniques to define limits on the distribution of measurements collected at a site. However, measures of representativeness are dynamic and are controlled by evolving site characterization and monitoring objectives. An evolutionary site characterization model, as shown in Figure 1, provides a systematic approach to the goal of consistent data collection.

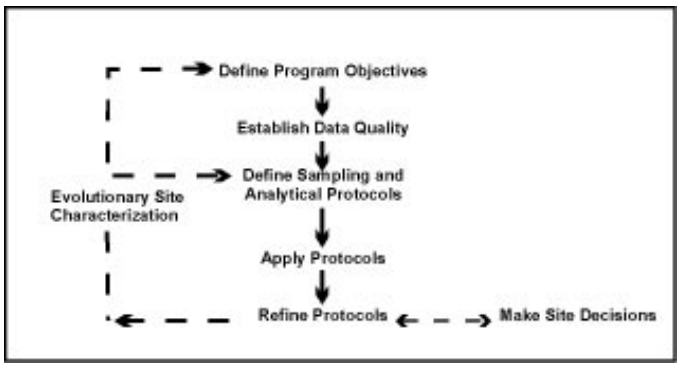

Figure 1. Evolutionary Site Characterization Model

The model emphasizes a recognition of the causes of the variability (e.g., use of inappropriate technology such as using bailers to purge wells; imprecise or operator-dependent methods) and the need to control avoidable errors.

1) Questions of Scale

A sampling plan designed to collect representative samples must take into account the potential scale of changes in site conditions through space and time as well as the chemical associations and behavior of the parameters that are targeted for investigation. In subsurface systems, physical (i.e., aquifer) and chemical properties over time or space are not statistically independent. In fact, samples taken in close proximity (i.e., within distances of a few meters) or within short time periods (i.e., more frequently than monthly) are highly auto-correlated. This means that designs employing high-sampling frequency (e.g., monthly) or dense spatial monitoring designs run the risk of redundant data collection and misleading inferences regarding trends in values that aren't statistically valid. In practice, contaminant detection and assessment monitoring programs rarely suffer these *over-sampling* concerns. In corrective-action evaluation programs, it is also possible that too little data may be collected over space or time. In these cases, false interpretation of the spatial extent of contamination or underestimation of temporal concentration variability may result.

2) Target Parameters

Parameter selection in monitoring program design is most often dictated by the regulatory status of the site. However, background water quality constituents, purging indicator parameters, and contaminants, all represent targets for data collection programs. The tools and procedures used in these programs should be equally rigorous and applicable to all categories of data, since all may be needed to determine or support regulatory action.

C. Sampling Point Design and Construction

Detailed site characterization is central to all decision-making purposes and the basis for this characterization resides in identification of the geologic framework and major hydro-stratigraphic units. Fundamental data for sample point location include: subsurface lithology, head-differences and background geochemical conditions. Each sampling point has a proper use or uses which should be documented at a level which is appropriate for the program's data quality objectives. Individual sampling points may not always be able to fulfill multiple monitoring objectives (e.g., detection, assessment, corrective action).

1) Compatibility with Monitoring Program and Data Quality Objectives

Specifics of sampling point location and design will be dictated by the complexity of subsurface lithology and variability in contaminant and/or geochemical conditions. It should be noted that, regardless of the ground-water sampling approach, few sampling points (e.g., wells, drive-points, screened augers) have zones of influence in excess of a few feet. Therefore, the spatial frequency of sampling points should be carefully selected and designed.

2) Flexibility of Sampling Point Design

In most cases *well-point* diameters in excess of 1 7/8 inches will permit the use of most types of submersible pumping devices for low-flow (minimal drawdown) sampling. It is suggested that *short* (e.g., less than 1.6 m) screens be incorporated into the monitoring design where possible so that comparable results from one device to another might be expected. *Short*, of course, is relative to the degree of vertical water quality variability expected at a site.

3) Equilibration of Sampling Point

Time should be allowed for equilibration of the well or sampling point with the formation after installation. Placement of well or sampling points in the subsurface produces some disturbance of ambient conditions. Drilling techniques (e.g., auger, rotary, etc.) are generally considered to cause more disturbance than *direct-push* technologies. In either case, there may be a period (i.e., days to months) during which water quality near the point may be distinctly different from that in the formation. Proper development of the sampling point and adjacent formation to remove fines created during emplacement will shorten this water quality *recovery* period.

III. Definition of Low-Flow Purging and Sampling

It is generally accepted that water in the well casing is non-representative of the formation water and needs to be purged prior to collection of ground-water samples. However, the water in the screened interval may indeed be representative of the formation, depending upon well construction and site hydrogeology. Wells are purged to some extent for the following reasons: the presence of the air interface at the top of the water column resulting in an oxygen concentration gradient with depth, loss of volatiles up the water column, leaching from or sorption to the casing or filter pack, chemical changes due to clay seals or backfill, and surface infiltration.

Low-flow purging, whether using portable or dedicated systems, should be done using pump-intake located in the middle or slightly above the middle of the screened interval. Placement of the pump too close to the bottom of the well will cause increased entrainment of solids which have collected in the well over time. These particles are present as a result of well development, prior purging and sampling events, and natural colloidal transport and deposition. Therefore, placement of the pump in the middle or toward the top of the screened interval is suggested. Placement of the pump at the top of the water column for sampling is only recommended in unconfined aquifers, screened across the water table, where this is the desired sampling point. Low-

flow purging has the advantage of minimizing mixing between the overlying stagnant casing water and water within the screened interval.

A. Low-Flow Purging and Sampling

Low-flow refers to the velocity with which water enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen. It does not necessarily refer to the flow rate of water discharged at the surface which can be affected by flow regulators or restrictions. Water level drawdown provides the best indication of the stress imparted by a given flow-rate for a given hydrological situation. The objective is to pump in a manner that minimizes stress (drawdown) to the system to the extent practical taking into account established site sampling objectives. Typically, flow rates on the order of 0.1 - 0.5 L/min are used, however this is dependent on site-specific hydrogeology. Some extremely coarse-textured formations have been successfully sampled in this manner at flow rates to 1 L/min. The effectiveness of using low-flow purging is intimately linked with proper screen location, screen length, and well construction and development techniques. The reestablishment of natural flow paths in both the vertical and horizontal directions is important for correct interpretation of the data. For high resolution sampling needs, screens less than 1 m should be used. Most of the need for purging has been found to be due to passing the sampling device through the overlying casing water which causes mixing of these stagnant waters and the dynamic waters within the screened interval. Additionally, there is disturbance to suspended sediment collected in the bottom of the casing and the displacement of water out into the formation immediately adjacent to the well screen. These disturbances and impacts can be avoided using dedicated sampling equipment, which precludes the need to insert the sampling device prior to purging and sampling.

Isolation of the screened interval water from the overlying stagnant casing water may be accomplished using low-flow minimal drawdown techniques. If the pump intake is located within the screened interval, most of the water pumped will be drawn in directly from the formation with little mixing of casing water or disturbance to the sampling zone. However, if the wells are not constructed and developed properly, zones other than those intended may be sampled. At some sites where geologic heterogeneities are sufficiently different within the screened interval, higher conductivity zones may be preferentially sampled. This is another reason to use shorter screened intervals, especially where high spatial resolution is a sampling objective.

B. Water Quality Indicator Parameters

It is recommended that water quality indicator parameters be used to determine purging needs prior to sample collection in each well. Stabilization of parameters such as pH, specific conductance, dissolved oxygen, oxidation-reduction potential, temperature and turbidity should be used to determine when formation water is accessed during purging. In general, the order of stabilization is pH, temperature, and specific conductance, followed by oxidation-reduction potential, dissolved oxygen and turbidity. Temperature and pH, while commonly used as purging indicators, are actually quite insensitive in distinguishing between formation water and stagnant casing water; nevertheless, these are important parameters for data interpretation purposes and should also be measured. Performance criteria for determination of stabilization should be based on water-level drawdown, pumping rate and equipment specifications for measuring indicator parameters. Instruments are available which utilize in-line flow cells to continuously measure the above parameters.

It is important to establish specific well stabilization criteria and then consistently follow the same methods thereafter, particularly with respect to drawdown, flow rate and sampling device. Generally, the time or purge volume required for parameter stabilization is independent of well depth or well volumes. Dependent variables are well diameter, sampling device, hydrogeochemistry, pump flow rate, and whether the devices are used in a portable or dedicated manner. If the sampling device is already in place (i.e., dedicated sampling systems), then the time and purge volume needed for stabilization is much shorter. Other advantages of dedicated equipment include less purge water for waste disposal, much less decontamination of equipment, less time spent in preparation of sampling as well as time in the field, and more consistency in the sampling approach which probably will translate into less variability in sampling results. The use of dedicated equipment is strongly recommended at wells which will undergo routine sampling over time.

If parameter stabilization criteria are too stringent, then minor oscillations in indicator parameters may cause purging operations to become unnecessarily protracted. It should also be noted that turbidity is a very conservative parameter in terms of stabilization. Turbidity is always the last parameter to stabilize. Excessive purge times are invariably related to the establishment of too stringent turbidity stabilization criteria. It should be noted that natural turbidity levels in ground water may exceed 10 nephelometric turbidity units (NTU).

C. Advantages and Disadvantages of Low-Flow (Minimum Drawdown) Purging

In general, the advantages of low-flow purging include:

- samples which are representative of the *mobile* load of contaminants present (dissolved and colloid-associated);
- minimal disturbance of the sampling point thereby minimizing sampling artifacts;
- less operator variability, greater operator control;

- reduced stress on the formation (minimal drawdown);
- less mixing of stagnant casing water with formation water;
- reduced need for filtration and, therefore, less time required for sampling;
- smaller purging volume which decreases waste disposal costs and sampling time;
- better sample consistency; reduced artificial sample variability.

Some disadvantages of low-flow purging are:

- higher initial capital costs,
- greater set-up time in the field,
- need to transport additional equipment to and from the site,
- increased training needs,
- resistance to change on the part of sampling practitioners,
- concern that new data will indicate a *change in conditions* and trigger an *action*.

IV. Low-Flow (Minimal Drawdown) Sampling Protocols

The following ground-water sampling procedure has evolved over many years of experience in ground-water sampling for organic and inorganic compound determinations and as such summarizes the authors' (and others) experiences to date (Barcelona et al., 1984, 1994; Barcelona and Helfrich, 1986; Puls and Barcelona, 1989; Puls et. al. 1990, 1992; Puls and Powell, 1992; Puls and Paul, 1995). High-quality chemical data collection is essential in ground-water monitoring and site characterization. The primary limitations to the collection of *representative* ground-water samples include: mixing of the stagnant casing and *fresh* screen waters during insertion of the sampling device or ground-water level measurement device; disturbance and resuspension of settled solids at the bottom of the well when using high pumping rates or raising and lowering a pump or bailer; introduction of atmospheric gases or degassing from the water during sample handling and transfer, or inappropriate use of vacuum sampling device, etc.

A. Sampling Recommendations

Water samples should not be taken immediately following well development. Sufficient time should be allowed for the ground-water flow regime in the vicinity of the monitoring well to stabilize and to approach chemical equilibrium with the well construction materials. This lag time will depend on site conditions and methods of installation but often exceeds one week.

Well purging is nearly always necessary to obtain samples of water flowing through the geologic formations in the screened interval. Rather than using a general but arbitrary guideline of purging three casing volumes prior to sampling, it is recommended that an in-line water quality measurement device (e.g., flow-through cell) be used to establish the stabilization time for several parameters (e.g. , pH, specific conductance, redox, dissolved oxygen, turbidity) on a well-specific basis. Data on pumping rate, drawdown, and volume required for parameter stabilization can be used as a guide for conducting subsequent sampling activities.

The following are recommendations to be considered before, during and after sampling:

- use low-flow rates (<0.5 L/min), during both purging and sampling to maintain minimal drawdown in the well;
- maximize tubing wall thickness, minimize tubing length;
- place the sampling device intake at the desired sampling point;
- minimize disturbances of the stagnant water column above the screened interval during water level measurement and sampling device insertion;
- make proper adjustments to stabilize the flow rate as soon as possible;
- monitor water quality indicators during purging;
- collect unfiltered samples to estimate contaminant loading and transport potential in the subsurface system.

B. Equipment Calibration

Prior to sampling, all sampling device and monitoring equipment should be calibrated according to manufacturer's recommendations and the site Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). Calibration of pH should be performed with at least two buffers which bracket the expected range. Dissolved oxygen calibration must be corrected for local barometric pressure readings and elevation.

C. Water Level Measurement and Monitoring

It is recommended that a device be used which will least disturb the water surface in the casing. Well depth should be obtained from the well logs. Measuring to the bottom of the well casing will only cause resuspension of settled solids from the formation and require longer purging times for turbidity equilibration. Measure well depth after sampling is completed. The water level measurement should be taken from a permanent reference point which is surveyed relative to ground elevation.

D. Pump Type

The use of low-flow (e.g., 0.1-0.5 L/min) pumps is suggested for purging and sampling all types of analytes. All pumps have some limitation and these should be investigated with respect to application at a particular site. Bailers are inappropriate devices for low-flow sampling.

1) General Considerations

There are no unusual requirements for ground-water sampling devices when using low-flow, minimal drawdown techniques. The major concern is that the device give consistent results and minimal disturbance of the sample across a range of *low* flow rates (i.e., < 0.5 L/min). Clearly, pumping rates that cause minimal to no drawdown in one well could easily cause *significant* drawdown in another well finished in a less transmissive formation. In this sense, the pump should not cause undue pressure or temperature changes or physical disturbance on the water sample over a reasonable sampling range. Consistency in operation is critical to meet accuracy and precision goals.

2) Advantages and Disadvantages of Sampling Devices

A variety of sampling devices are available for low-flow (minimal drawdown) purging and sampling and include peristaltic pumps, bladder pumps, electrical submersible pumps, and gas-driven pumps. Devices which lend themselves to both dedication and consistent operation at definable low-flow rates are preferred. It is desirable that the pump be easily adjustable and operate reliably at these lower flow rates. The peristaltic pump is limited to shallow applications and can cause degassing resulting in alteration of pH, alkalinity, and some volatiles loss. Gas-driven pumps should be of a type that does not allow the gas to be in direct contact with the sampled fluid.

Clearly, bailers and other *grab* type samplers are ill-suited for low-flow sampling since they will cause repeated disturbance and mixing of *stagnant* water in the casing and the *dynamic* water in the screened interval. Similarly, the use of inertial lift foot-valve type samplers may cause too much disturbance at the point of sampling. Use of these devices also tends to introduce uncontrolled and unacceptable operator variability.

Summaries of advantages and disadvantages of various sampling devices are listed in Herzog et al. (1991), U. S. EPA (1992), Parker (1994) and Thurnblad (1994).

E. Pump Installation

Dedicated sampling devices (left in the well) capable of pumping and sampling are preferred over <u>any</u> other type of device. Any portable sampling device should be slowly and carefully lowered to the middle of the screened interval or slightly above the middle (e.g., 1-1.5 m below the top of a 3 m screen). This is to minimize excessive mixing of the stagnant water in the casing above the screen with the screened interval zone water, and to minimize resuspension of solids which will have collected at the bottom of the well. These two disturbance effects have been shown to directly affect the time required for purging. There also appears to be a direct correlation between size of portable sampling devices relative to the well bore and resulting purge volumes and times. The key is to minimize disturbance of water and solids in the well casing.

F. Filtration

Decisions to filter samples should be dictated by sampling objectives rather than as a *fix* for poor sampling practices, and field-filtering of certain constituents should not be the default. Consideration should be given as to what the application of field-filtration is trying to accomplish. For assessment of truly dissolved (as opposed to operationally *dissolved* [i.e., samples filtered with 0.45 µm filters]) concentrations of major ions and trace metals, 0.1 µm filters are recommended although 0.45 µm filters are normally used for most regulatory programs. Alkalinity samples must also be filtered if significant particulate calcium carbonate is suspected, since this material is likely to impact alkalinity titration results (although filtration itself may alter the CO_2 composition of the sample and, therefore, affect the results).

Although filtration may be appropriate, filtration of a sample may cause a number of unintended changes to occur (e.g. oxidation, aeration) possibly leading to filtration-induced artifacts during sample analysis and uncertainty in the results. Some of these unintended changes may be unavoidable but the factors leading to them must be recognized. Deleterious effects can be minimized by consistent application of certain filtration guidelines. Guidelines should address selection of filter type, media, pore size, etc. in order to identify and minimize potential sources of uncertainty when filtering samples.

In-line filtration is recommended because it provides better consistency through less sample handling, and minimizes sample exposure to the atmosphere. In-line filters are available in both disposable (barrel filters) and non-disposable (in-line filter holder, flat membrane filters) formats and various filter pore sizes (0.1-5.0 µm). Disposable filter cartridges have the advantage of greater sediment handling capacity when compared to traditional membrane filters. Filters must be pre-rinsed following manufacturer's recommendations. If there are no recommendations for rinsing, pass through a minimum of 1 L of ground water following purging and prior to sampling. Once filtration has begun, a filter cake may develop as particles larger than the pore size accumulate on the filter membrane. The result is that the effective pore diameter of the membrane is reduced and particles smaller than the stated pore size are excluded from the filtrate. Possible corrective measures include prefiltering (with larger pore size filters), minimizing particle loads to begin with, and reducing sample volume.

G. Monitoring of Water Level and Water Quality Indicator Parameters

Check water level periodically to monitor drawdown in the well as a guide to flow rate adjustment. The goal is minimal drawdown (<0.1 m) during purging. This goal may be difficult to achieve under some circumstances due to geologic heterogeneities within the screened interval, and may require adjustment based on site-specific conditions and personal experience. In-line water quality indicator parameters should be continuously monitored during purging. The water quality

indicator parameters monitored can include pH, redox potential, conductivity, dissolved oxygen (DO) and turbidity. The last three parameters are often most sensitive. Pumping rate, drawdown, and the time or volume required to obtain stabilization of parameter readings can be used as a future guide to purge the well. Measurements should be taken every three to five minutes if the above suggested rates are used. Stabilization is achieved after all parameters have stabilized for three successive readings. In lieu of measuring all five parameters, a minimum subset would include pH, conductivity, and turbidity or DO. Three successive readings should be within ± 0.1 for pH, ± 3% for conductivity, ± 10 mv for redox potential, and ± 10% for turbidity and DO. Stabilized purge indicator parameter trends are generally obvious and follow either an exponential or asymptotic change to stable values during purging. Dissolved oxygen and turbidity usually require the longest time for stabilization. The above stabilization guidelines are provided for rough estimates based on experience.

H. Sampling, Sample Containers, Preservation and Decontamination

Upon parameter stabilization, sampling can be initiated. If an in-line device is used to monitor water quality parameters, it should be disconnected or bypassed during sample collection. Sampling flow rate may remain at established purge rate or may be adjusted slightly to minimize aeration, bubble formation, turbulent filling of sample bottles, or loss of volatiles due to extended residence time in tubing. Typically, flow rates less than 0.5 L/min are appropriate. The same device should be used for sampling as was used for purging. Sampling should occur in a progression from least to most contaminated well, if this is known. Generally, volatile (e.g., solvents and fuel constituents) and gas sensitive (e.g., Fe^{2+}, CH_4, H_2S/HS^-, alkalinity) parameters should be sampled first. The sequence in which samples for most inorganic parameters are collected is immaterial unless filtered (dissolved) samples are desired. Filtering should be done last and in-line filters should be used as discussed above. During both well purging and sampling, proper protective clothing and equipment must be used based upon the type and level of contaminants present.

The appropriate sample container will be prepared in advance of actual sample collection for the analytes of interest and include sample preservative where necessary. Water samples should be collected directly into this container from the pump tubing.

Immediately after a sample bottle has been filled, it must be preserved as specified in the site (QAPP). Sample preservation requirements are based on the analyses being performed (use site QAPP, FSP, RCRA guidance document [U. S. EPA, 1992] or EPA SW-846 [U. S. EPA, 1982]). It may be advisable to add preservatives to sample bottles in a controlled setting prior to entering the field in order to reduce the chances of improperly preserving sample bottles or introducing field contaminants into a sample bottle while adding the preservatives.

The preservatives should be transferred from the chemical bottle to the sample container using a disposable polyethylene pipet and the disposable pipet should be used only once and then discarded.

After a sample container has been filled with ground water, a Teflon™ (or tin)-lined cap is screwed on tightly to prevent the container from leaking. A sample label is filled out as specified in the FSP. The samples should be stored inverted at 4°C.

Specific decontamination protocols for sampling devices are dependent to some extent on the type of device used and the type of contaminants encountered. Refer to the site QAPP and FSP for specific requirements.

I. Blanks

The following blanks should be collected:

(1) field blank: one field blank should be collected from each source water (distilled/deionized water) used for sampling equipment decontamination or for assisting well development procedures.

(2) equipment blank: one equipment blank should be taken prior to the commencement of field work, from each set of sampling equipment to be used for that day. Refer to site QAPP or FSP for specific requirements.

(3) trip blank: a trip blank is required to accompany each volatile sample shipment. These blanks are prepared in the laboratory by filling a 40-mL volatile organic analysis (VOA) bottle with distilled/deionized water.

V. Low-Permeability Formations and Fractured Rock

The overall sampling program goals or sampling objectives will drive how the sampling points are located, installed, and choice of sampling device. Likewise, site-specific hydrogeologic factors will affect these decisions. Sites with very low permeability formations or fractures causing discrete flow channels may require a unique monitoring approach. Unlike water supply wells, wells installed for ground-water quality assessment and restoration programs are often installed in low water-yielding settings (e.g., clays, silts). Alternative types of sampling points and sampling methods are often needed in these types of environments, because low-permeability settings may require extremely low-flow purging (<0.1 L/min) and may be technology-limited. Where devices are not readily available to pump at such low flow rates, the primary consideration is to avoid dewatering of

the well screen. This may require repeated recovery of the water during purging while leaving the pump in place within the well screen.

Use of low-flow techniques may be impractical in these settings, depending upon the water recharge rates. The sampler and the end-user of data collected from such wells need to understand the limitations of the data collected; i.e., a strong potential for underestimation of actual contaminant concentrations for volatile organics, potential false negatives for filtered metals and potential false positives for unfiltered metals. It is suggested that comparisons be made between samples recovered using low-flow purging techniques and samples recovered using passive sampling techniques (i.e., two sets of samples). Passive sample collection would essentially entail acquisition of the sample with no or very little purging using a dedicated sampling system installed within the screened interval or a passive sample collection device.

A. Low-Permeability Formations (<0.1 L/min recharge)

1. Low-Flow Purging and Sampling with Pumps

a. "portable or non-dedicated mode" - Lower the pump (one capable of pumping at <0.1 L/min) to mid-screen or slightly above and set in place for minimum of 48 hours (to lessen purge volume requirements). After 48 hours, use procedures listed in Part IV above regarding monitoring water quality parameters for stabilization, etc., but do not dewater the screen. If excessive drawdown and slow recovery is a problem, then alternate approaches such as those listed below may be better.

b. "dedicated mode" - Set the pump as above at least a week prior to sampling; that is, operate in a dedicated pump mode. With this approach significant reductions in purge volume should be realized. Water quality parameters should stabilize quite rapidly due to less disturbance of the sampling zone.

2. Passive Sample Collection

Passive sampling collection requires insertion of the device into the screened interval for a sufficient time period to allow flow and sample equilibration before extraction for analysis. Conceptually, the extraction of water from low yielding formations seems more akin to the collection of water from the unsaturated zone and passive sampling techniques may be more appropriate in terms of obtaining "representative" samples. Satisfying usual sample volume requirements is typically a problem with this approach and some latitude will be needed on the part of regulatory entities to achieve sampling objectives.

B. Fractured Rock

In fractured rock formations, a low-flow to zero purging approach using pumps in conjunction with packers to isolate the sampling zone in the borehole is suggested. Passive multi-layer sampling devices may also provide the most "representative" samples. It is imperative in these settings to identify flow paths or water-producing fractures prior to sampling using tools such as borehole flowmeters and/or other geophysical tools.

After identification of water-bearing fractures, install packer(s) and pump assembly for sample collection using low-flow sampling in "dedicated mode" or use a passive sampling device which can isolate the identified water-bearing fractures.

VI. Documentation

The usual practices for documenting the sampling event should be used for low-flow purging and sampling techniques. This should include, at a minimum: information on the conduct of purging operations (flow-rate, drawdown, water-quality parameter values, volumes extracted and times for measurements), field instrument calibration data, water sampling forms and chain of custody forms. See Figures 2 and 3 and "Ground Water Sampling Workshop -- A Workshop Summary" (U. S. EPA, 1995) for example forms and other documentation suggestions and information. This information coupled with laboratory analytical data and validation data are needed to judge the "useability" of the sampling data.

VII. Notice

The U.S. Environmental Protection Agency through its Office of Research and Development funded and managed the research described herein as part of its in-house research program and under Contract No. 68-C4-0031 to Dynamac Corporation. It has been subjected to the Agency's peer and administrative review and has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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Figure 2. **Ground Water Sampling Log**

Project _____ **Site** _____ **Well No.** _____ **Date** _____
Well Depth _____ **Screen Length** _____ **Well Diameter** _____ **Casing Type** _____
Sampling Device _____ **Tubing type** _____ **Water Level** _____
Measuring Point _____ **Other Infor** _____

_____

Sampling Personnel _____

Time	pH	Temp	Cond.	Dis.O_2	Turb.	[ ]Conc			Notes

Type of Samples Collected

_____

Information: 2 in = 617 ml/ft, 4 in = 2470 ml/ft: $Vol_{cyl} = \pi r^2 h$, $Vol_{sphere} = 4/3\pi r^3$

Figure 3. **Ground Water Sampling Log** (with automatic data logging for most water quality parameters)

Project _____ **Site** _____ **Well No.** _____ **Date** _____
Well Depth _____ **Screen Length** _____ **Well Diameter** _____ **Casing Type** _____
Sampling Device _____ **Tubing type** _____ **Water Level** _____
Measuring Point _____ **Other Infor** _____

_____

Sampling Personnel _____

Time	Pump Rate	Turbidity	Alkalinity	[ ] Conc	Notes

Type of Samples Collected

_____

Information: 2 in = 617 ml/ft, 4 in = 2470 ml/ft: $Vol_{cyl} = \pi r^2 h$, $Vol_{sphere} = 4/3\pi r^3$

ATTACHMENT B
QUALITY ASSURANCE PROJECT PLAN

JUNG SUN LAUNDRY PLUME
IMMEDIATE INVESTIGATIOIN WORK ASSIGNMENT
SITE CHARACTERIZATION
Site Number: 241102

Work Assignment No.
D004436-11

Prepared for:

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
625 Broadway
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December 2007

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APPENDICES

1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The purpose of this Quality Assurance Project Plan (QAPP) is to document planned investigative activities to be conducted for an Immediate Investigation Work Assignment (IIWA) and establish the criteria for performing these activities at a pre-determined quality at the Jung Sun Laundry Plume Site in Long Island City, Queens County, New York, Site 2-41-102. The work will be completed by Earth Tech Northeast, Inc. (Earth Tech) under Earth Tech/New York State Department of Environmental Conservation (NYSDEC) Superfund Standby Contract Work Assignment No. D004436-11.

Project work to be conducted is specified in the NYSDEC Work Assignment (August 31, 2007) as modified based on the scoping session/site inspection (conducted September 19, 2007) and as summarized in the attached Work Plan. The IIWA will be implemented in general accordance with NYSDEC Technical Guidance for Site Remediation and Investigation (Draft), DER-10, NYSDEC Division of Environmental Remediation, December 2002.

1.2 SUMMARY OF PREVIOUS INVESTIGATIONS

Information on site history and previous investigations has been summarized in detail in Sections 1.2.1 and 1.2.2 of the WP; this information is not repeated here.

1.3 PROJECT DESCRIPTION

This QAPP is based on the scope of work which is described in the Work Plan. As identified in the WP, the major tasks comprising this work assignment are:

- Task 1 – Project Scoping/Work Plan Development. Although not explicitly identified as such in the NYSDEC Scope of Work (August, 2007), Work Plan Development will be included in this task.
- Task 2 – Geophysical Survey/ Subsurface Investigation, consisting of:
    - Geophysical Survey
    - Sub-Surface Investigation, comprised of
        - Soil Boring/Membrane Interface Probes
        - Soil Sampling (from borings)
        - Direct Push Well Installation
        - Groundwater Sampling from new and existing monitoring wells
        - Site Survey

- Task 3 – Characterization Report
    - Records/Background Search
    - Data Usability Report
    - Characterization Report

1.4 PROJECT MANAGEMENT AND ORGANIZATION

1.4.1 Personnel

The general responsibilities of key project personnel are listed below.

Program Manager	M. Thiagaram, P.E. (Earth Tech), Program Manager will have responsibility for overall program management.
Project Manager	C. Hunt (Earth Tech), Project Manager, will have responsibility for overall project management, coordination with NYSDEC and coordination of subcontractors to complete the work.
Field Team Leader	C. Foster will have overall responsibility of implementing and coordinating field activities.
QA Officer	A. Burton will serve as Quality Assurance Officer, and will be responsible for laboratory and data validation subcontractor procurement and assignment, as well as providing overall direction for the QA program (including the QAPP and the final data usability assessment).
H & S Officer	B. Poll, Earth Tech Northeast Safety Manger, will oversee the health and safety aspects of this assignment. He, or his designee, will have the responsibility for approval of the project health and safety plan, and tracking its implementation. He will also verify that on-site subcontractors either have their own (acceptable) HASP; or confirm in writing that the subcontractors will abide by the provisions of the Earth Tech HASP.

1.4.2 Subcontractors

Earth Tech has obtained subcontractors for geophysical survey, laboratory/analytical services, data validation/data usability reports, soil borings and well installation, membrane interface probe installation, and site survey. The planned subcontractors for utilization for this project are:

- Geophysical Survey/Utility Clearance – Earth Tech tentatively plans to use NAVEA Geophysics, Inc. for providing utility clearance at the boring and monitoring well locations.
- Laboratory Analysis – Earth Tech tentatively plans to utilize Hampton Clarke Veritech (HCV), a NY ESD-certified WBE firm. HCV is certified by NYSDOH Wadsworth ELAP for all applicable parameters and matrices.
- Drilling Services – Earth Tech tentatively plans to use ZEBRA Environmental Corp., for advancement of the direct push (e.g., Geoprobe) borings, collection of groundwater

samples from the borings, and direct push well installation.

- Data Validation – Earth Tech tentatively plans to utilize Environmental Data Services, Inc., a NY ESD-certified WBE firm, for data validation and preparation of the data usability report.
- Site (Land) Surveying - Earth Tech will utilize Naik Consulting Group, a NY ESD-certified MBE firm, a NYS-licensed surveyor who will prepare the topographic base map documenting sampling locations and property lines.

2.0 SITE INVESTIGATION PROCEDURES

Environmental sampling and other field activities will be performed as specified by NYSDEC in the Work Assignment and detailed in the Field Activities Plan (Work Plan Attachment A) and in general accordance with the appropriate techniques presented in the following guidance documents.

- Technical Guidance for Site Remediation and Investigation (Draft), DER-10, NYSDEC Division of Environmental Remediation, December 2002.

Table 1 contains a list of the various media to be sampled and the expected number of samples for each matrix.

3.0 SAMPLE HANDLING

3.1 SAMPLE IDENTIFICATION/LABELING

Sample identification and labeling requirements are presented in FAP Section 6 and are not repeated here.

3.2 SAMPLE PRESERVATION AND HOLDING TIME

Sample container, preservation, and holding time requirements are summarized on Table 1.

SW-846 Method 8260B will be used for VOCs in soil and groundwater.

Soil samples for IDW characterization will be analyzed for TCLP fractions by applicable SW-846 methods (8260B fro VOCs; 8270C for SVOCs; 8081 for pesticides; and 8151 for herbicides). Soil samples will be extracted by method 1311. If required for NY hazardous characteristics, total PCBs (without extraction) will be analyzed by SW-846 method 8082.

3.2.1 Sample Containers

The sample containers for groundwater samples and trip and field blanks will be provided by the analytical laboratory. Earth Tech will provide the EnCore (or equivalent) samplers for collection and shipment of soil samples for VOC analysis.

3.2.2 Sample Preservation

Groundwater samples submitted for VOC analysis will be preserved to a pH of ≤2 with hydrochloric acid (HCl). The laboratory will provide pre-preserved 40-mL VOA vials for this purpose. Soil samples are not preserved in the field. All samples (soil and groundwater) are cooled to 4º C (±2º C)

after collection and maintained at that temperature through shipping and receipt at the laboratory.

3.2.3 Holding Times

Holding times are judged from the verified time of sample receipt (VTSR) by the laboratory. Samples will be shipped from the field to arrive at the laboratory by the day after the sample is collected. Samples collected on Friday will be shipped for Saturday delivery.

For the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered.

3.3 CHAIN OF CUSTODY AND SHIPPING

A chain-of-custody form will trace the path of sample containers from the project site to the laboratory. A sample Chain-of-Custody form is included in Appendix 1. Sample/bottle tracking sheets or the chain-of-custody will be used to document the custody of the samples within the laboratory from sample receipt though completion of analysis. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples, and the anticipated date of arrival. Sample shipping containers will be provided by the laboratory for shipping samples. All sample containers within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory.

In addition, each sample shipping container will be sealed with two adhesive custody seals. The custody seals will be initialed by a member of the field sampling team.

4.0 DATA QUALITY REQUIREMENTS

Analytical methods and data quality requirements are discussed below. Sample containers (except for Encore samplers for VOCs in soil) and sample analyses will be provided by Hampton Clarke, a NYSDOH ELAP-certified laboratory.

4.1 ANALYTICAL METHODS

Groundwater samples will be analyzed for VOCs by SW-846 Method 8260B (low level option).

Soil samples will be analyzed for VOCs by SW-846 Method 8260B.

One sample of each matrix, representing the investigation-derived waste, may also be analyzed for waste classification purposes; at this time, assumed to be the full suite (all analytical fractions) for toxicity characteristic leaching procedure (TCLP) analyses. Specific analyses to be performed may be modified to satisfy the requirements of the facility at which the IDW is disposed.

4.2 QUALITY ASSURANCE OBJECTIVES

Data quality objectives (DQOs) for measurement data in terms of sensitivity and the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness) are established so that the data collected are sufficient and of adequate quality for their intended use. Data collected and analyzed in conformance with the DQO process described in this QAPP will be

used in assessing the uncertainty associated with decisions related to this site.

4.2.1 Sensitivity

For VOCs in groundwater, a reporting limit (RL) goal of 1 µg/L has been established for the contaminants of concern (chlorinated solvents, especially TCE, PCE, and vinyl chloride) to adequately assess the extent of groundwater contaminant migration and potential degradation products, and also for comparability with existing data. USEPA Method SW-846 Method 8260B with a 25 mL purge volume can meet this goal; as the low level calibration standard is set to 1 µg/L, and the method detection limits (MDLs) typically a factor of five or ten lower than the RL.

Reporting limits for VOCs in soil will be the default (standard) limits for the methods; the analyte-specific RLs and MDLs are shown in Appendix 2. It should be noted that although the RDLs for VOCs in soil by 8260B are 5 µg/kg, the MDLs for the site-related contaminants are all well below 1.0 µg/kg. Therefore, the laboratory can and will report detections of these analytes down to 1 µg/kg or lower; reported detections at concentration less than the lowest calibration standard (5 µg/kg) will be qualified as estimated (flagged "J").

A copy of Hampton Clarke's current MDL and RDLs for VOCs in aqueous and non-aqueous matrices is provided in Appendix 2.

4.2.2 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is easier to control and quantify than sampling precision; there are more historical data related to individual method performance and the "universe" is not limited to the samples received in the laboratory. In contrast, sampling precision is unique to each site or project.

Overall system (sampling plus analytical) precision will be determined by analysis of field duplicate samples. Analytical results from laboratory duplicate samples will provide data on measurement (analytical) precision.

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Field duplicates will be collected at a frequency of one per 10 environmental samples of each type.

Relative Percent Difference (RPD) criteria are used to evaluate precision between duplicates, using the equation below

$$RPD = 100 \times [2(X_1 - X_2) / (X_1 + X_2)]$$

where:

X_1 and X_2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Criteria for evaluation of laboratory duplicates are specified in the applicable methods. The objective for field duplicate precision is $\leq$ 50% RPD for all matrices. Precision is not calculable

where the analyte is not detected in one or both of the sample and duplicate. The absolute difference between the results (X_1 - X_2) may be a more appropriate measure of analytical precision where the reported concentrations are low (i.e., less than five times the RL).

4.2.3 Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent recovery criteria, published by the NYSDEC as part of the ASP, and those determined from laboratory performance data are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike will be performed once for every sample delivery group (SDG) as specified in the ASP-CLP. Other method-specific laboratory QC samples (such as laboratory control samples and continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

%R = (SSR-SR)/SA x 100,

where

SSR = Spiked sample Result

SR = Sample Result, and

SA = Spike Added

4.2.4 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions.

Representativeness is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

4.2.5 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), USEPA, or the New York State Department of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and,
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

Comparability is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

4.2.6 Completeness

The goal of completeness is to generate the maximum amount possible of valid data. The highest degree of completeness would be to find all deliverables flawless, valid, and acceptable. The lowest level of completeness is excessive failure to meet established acceptance criteria and consequent rejection of data. The completeness goal is 95 percent useable data (i.e., less than 5 percent rejected data). However, it is acknowledged that this goal may not be fully achievable; for example, individual analytes may be rejected within an otherwise acceptable analysis; or some sampling locations may not be accessible. The impact of rejected or unusable data will be made on a case-by-case basis. If the study can be completed without the missing datum or data, no further action would be necessary. However, loss of critical data may require re-sampling or reanalysis.

4.3 FIELD QUALITY ASSURANCE

Field quality assurance/quality control samples associated with the generation of environmental data typically include field (equipment rinsate) blanks; field duplicates; and trip blanks. The rationale and frequency of each of these are discussed below.

4.3.1 Equipment (Rinsate) Blanks

Equipment blanks are not required when laboratory-decontaminated, dedicated sampling equipment is used. One equipment rinsate blank will be collected for the sampling equipment used to collect groundwater samples. NYSDEC has also indicated that field blanks are not required for this project for soil samples.

4.3.2 Field Duplicate Samples

Duplicates will be collected at a frequency of one per 20 (or fewer) samples of each type, and will be analyzed for the same parameters as the environmental sample. Based on the estimated number of field samples, the number of field duplicates is shown below.

Duplicate MIP samples will be generated by collecting side-by-side probes.

Duplicate groundwater samples will be collected by alternately filling laboratory-provided VOA vials.

Duplicate soil samples for VOC analysis will be generated by filling two sets of EnCore samplers from as close to the same physical location of the retrieved material as possible. (Samples for VOC analysis are not homogenized.)

Sample Type	Est. Sample Qty	Field Duplicates
MIP	5	1
Groundwater	15	1
Soil	3	1

4.3.3 Trip Blanks

The purpose of a trip blank is to place a mechanism of control on sample container preparation, quality, and sample handling. The trip blank travels from the lab to the site with the empty sample container and back from the site with the collected samples. One trip blank will be submitted with each sample shipment of water samples (currently, estimated to be three) and analyzed for VOCs.

Trip blanks will not be submitted for the soil or MIP samples.

4.4 LABORATORY QUALITY ASSURANCE

Method-required laboratory quality assurance for Method 8260B includes an instrument performance check; calibration check; and method blank analysis for each group of 20 or fewer samples. In addition, internal standards are added to every sample (environmental samples and laboratory QA/QC samples).

4.4.1 Instrument Performance Check

The instrument performance check verifies the operation of the GC/MS and verifies that it meets tuning and mass spectral abundance criteria prior to sample data acquisition. For Method SW-846 8260B, the instrument performance check standard is bromofluorobenzene (BFB), and the acceptance criteria are specified in Table 4 of the method. No samples may be analyzed without meeting the BFB acceptance criteria.

4.4.2 System Performance Checks

A system performance check must be made during each 12-hour analytical shift. Each system performance check compound (SPCC) must meet the SPCC-specific response factor (as specified in the method). If the minimum response factors are not met, corrective action must be taken and no samples may be analyzed until the response factors of all SPCCs meet critieria.

4.4.3 Calibration Checks

An initial five-point calibration check must be performed after the instrument performance check but prior to the analysis of blanks and samples. Concentrations of the calibration standards should be selected to span the concentration range of interest. One of the concentrations of the initial calibration must be the same as the daily calibration check.

After initial calibration and after the system performance check is met, a calibration check (consisting of six method-specified calibration check compounds [CCCs] must be analyzed. If the percent difference of drift exceeds 20 percent, corrective action must be taken prior to the analysis of samples.

4.4.4 Method Blanks

Method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instrument as the sample is prepared and analyzed in the laboratory. For method TO-15, a laboratory method blank is an unused, certified canister that has not left the laboratory. The blank canister is pressurized with humidified, ultra-pure zero air and carried through the entire analytical sequence.

The method blank should not contain any target analytic at a concentration greater than its quantitation level (reporting limit; typically, three times the MDL) or its action level, whichever is more stringent. Method blanks are analyzed at a frequency of one for every 20 samples analyzed, or every analytical batch, whichever is more frequent.

4.4.5 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Site-specific MS/MSD samples will not be submitted. The laboratory will report MS/MSD results from samples analyzed in the same batch (SDG) as the Jung Sun Laundry Plume site samples.

4.4.6 Internal Standards

Internal standards (IS) are added to every sample analyzed for VOCs (in any matrix) and SVOCs. Sample-specific IS recovery should be ±40 percent of the mean response in the most recent valid calibration.

5.0 DATA DOCUMENTATION

5.1 FIELD NOTEBOOK

Field notebooks will be utilized to record information not recorded on standard forms. The use and completion of field notebooks is described in the FAP (Section 8) and is not repeated in the QAPP.

5.2 FIELD REPORTING FORMS

Field reporting forms (or their equivalent) to be utilized in this investigation include the following are specified in the FAP (Attachment A to the WP) and examples are provided in FAP Appendix 1.

Custody documentation will documented from time of sample collection through arrival at the laboratory with a chain Chain-of- Custody Form (example provided in Appendix 1).

These forms, when completed, will become part of the project file.

6.0 LABORATORY EQUIPMENT CALIBRATION AND MAINTENANCE

Laboratory equipment will be calibrated according to the requirements of the NYSDEC ASP, Superfund Contract Laboratory Program for each parameter or group of similar parameters, and maintained following professional judgment and the manufacturer's specifications.

7.0 CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work.

Subcontractors providing analytical services should perform their own internal laboratory audits and calibration procedures with data review conducted at a frequency so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work. In addition, maintaining the necessary certification (e.g., ELAP; NELAC) requires that the laboratories be subject to third-party audits and also achieve acceptable results on proficiency (performance evaluation) samples.

Situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, the responsible individual for initiating the corrective action and also the individual responsible for approving the corrective action, if necessary, will be identified.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

The guidance followed to perform quality data validation, and the methods and procedures outlined herein and elsewhere in the Work Plan, pertain to initiating and performing data validation, as well as reviewing data validation performed by others (if applicable). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

8.1 LABORATORY DATA REPORTING AND REDUCTION

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the NYSDEC ASP Category B deliverable requirements.

In addition to the hard copy of the data report, the laboratory will be asked to provide the sample data in spreadsheet form on computer diskette. The diskette will be generated to the extent possible directly from the laboratory's electronic files or information management system to minimize possible transcription errors resulting from the manual transcription of data.

The laboratory will also provide the electronic deliverable in NYSDEC "EZ-EDD" format, as described in ASP 2005 Exhibit H, Section 1.1.1.

8.2 DATA VALIDATION

A subcontractor to Earth Tech will review and validate the soil and groundwater data (VOCs by 8260B data). Data validation will be performed by following guidelines established in the specific US EPA Region 2 SOPs, as indicated below.

- Volatile organic data generated by SW-846 method 8260B will be validated in accordance with HW-24, "Standard Operating Procedure for the Validation of Organic Data Acquired Using SW-846 Method 82660B" (Revision 1, January 1999).

Where necessary and appropriate, supplemental validation criteria may be derived from the EPA Functional Guidelines (USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA 540/R-99/008; October, 1999, and National Functional Guidelines for Inorganic Data Review, EPA 540/R-04-004; October 2004), as appropriate.

Validation reports will consist of text results of the review and marked up copies of Form I (results with qualifiers applied by the validator). Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be documented in the report text. The results of the data validation will be presented in a data Usability Summary Report (DUSR) prepared by the validation subcontractor.

8.3 DATA USABILITY

Subsequent to review of the items evaluated in the subcontractor DUSR and accompanying tables, Earth Tech then prepares a brief data usability summary. The data usability summary, which will be provided as part of the site investigation report, encompasses both quantitative and qualitative aspects, although the qualitative element is the most significant.

The quantitative aspect is a summary of the data quality as expressed by qualifiers applied to the data; the percent rejected, qualified (i.e., estimated), missing, and fully acceptable data are reported. As appropriate, this quantitative summary is broken down by matrix, laboratory, or analytical fraction or method.

The qualitative element of the data usability summary is the QA officer's translation and summary of the validation reports into a discussion useful to data users. The qualitative aspect will discuss the significance of the qualifications applied to the data, especially in terms of those most relevant to the intended use of the data. The usability report will also indicate whether there is a suspected bias (high or low) in qualified data, and will also provide a subjective overall assessment of the data quality.

8.4 FIELD DATA

Field data collected during the field activity will be presented in tabular form with any necessary supporting text. Unless activities resulted in significant unexpected results, field data comments can be added as footnotes to the tables.

9.0 PERFORMANCE AND SYSTEM AUDITS

As part of the laboratory subcontractor procurement process under the Earth Tech/NYSDEC Contract, the laboratory assigned to this project has been verified to be certified by the NYSDOH Environmental Laboratory Approval Program for the analytical protocols to be used. Therefore, no laboratory audit specific to this study will be performed unless warranted by a problem(s) that cannot be resolved by any other means, or at the discretion of Earth Tech and the NYSDEC.

Due to the short duration and limited scope of the field investigation, no field systems audit is planned for this project.

10.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Quality assurance reporting for this project is limited to the DUSR (prepared by subcontract data validator) and the QA/QC summary narrative provided in the site investigation letter report.

The project manager, through task managers, will be responsible for verifying that records and files related to this project are stored appropriately and are retrievable.

The laboratory will submit any memoranda or correspondence related to quality control of this project's samples as part of its deliverables package.

Table 1

Quality Assurance Project Plan
Jung Sun Laundry Plume

Sample Bottle, Volume, Preservation, and Holding Time Summary

MATRIX/ANALYSIS	Sample Prep Method [1]	Analytical Method	Sample Bottles (2)				Minimum	Preservation	Holding Time (3, 4)		Comment
			Mat'l	Size	Qty	Source	Vol Rqd	(3)	Extraction	Analysis	
Soil Samples											
Soil - Volatile Organics	SW 846 5035	SW 846 8260B	Encore	5 g	3	ET Vendor	5 g	None	NA	14 days	
Groundwater Samples											
Water - Volatile Organics	SW 846 5030	SW 846 8260B	G	40 mL	3	HCV	40 mL	HCl to pH ≤ 2	NA	14 days	

(1) Laboratory may propose alternate extraction/preparation methods, subject to Earth Tech approval.
(2) Bottles as planned by HCV. Earth Tech will acquire and provide EnCore samplers for VOCs in soil. Quantity includes additional VOC vials provided for laboratory screening.
(3) All samples for chemical analysis should be held at 4 degrees C in addition to any chemical preservation required.
(4) Holding time for calculated from day of collection, unless noted as being from time of extraction.

G = Glass
SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. USEPA SW-846. Complete through Update IIIB, November 2004.

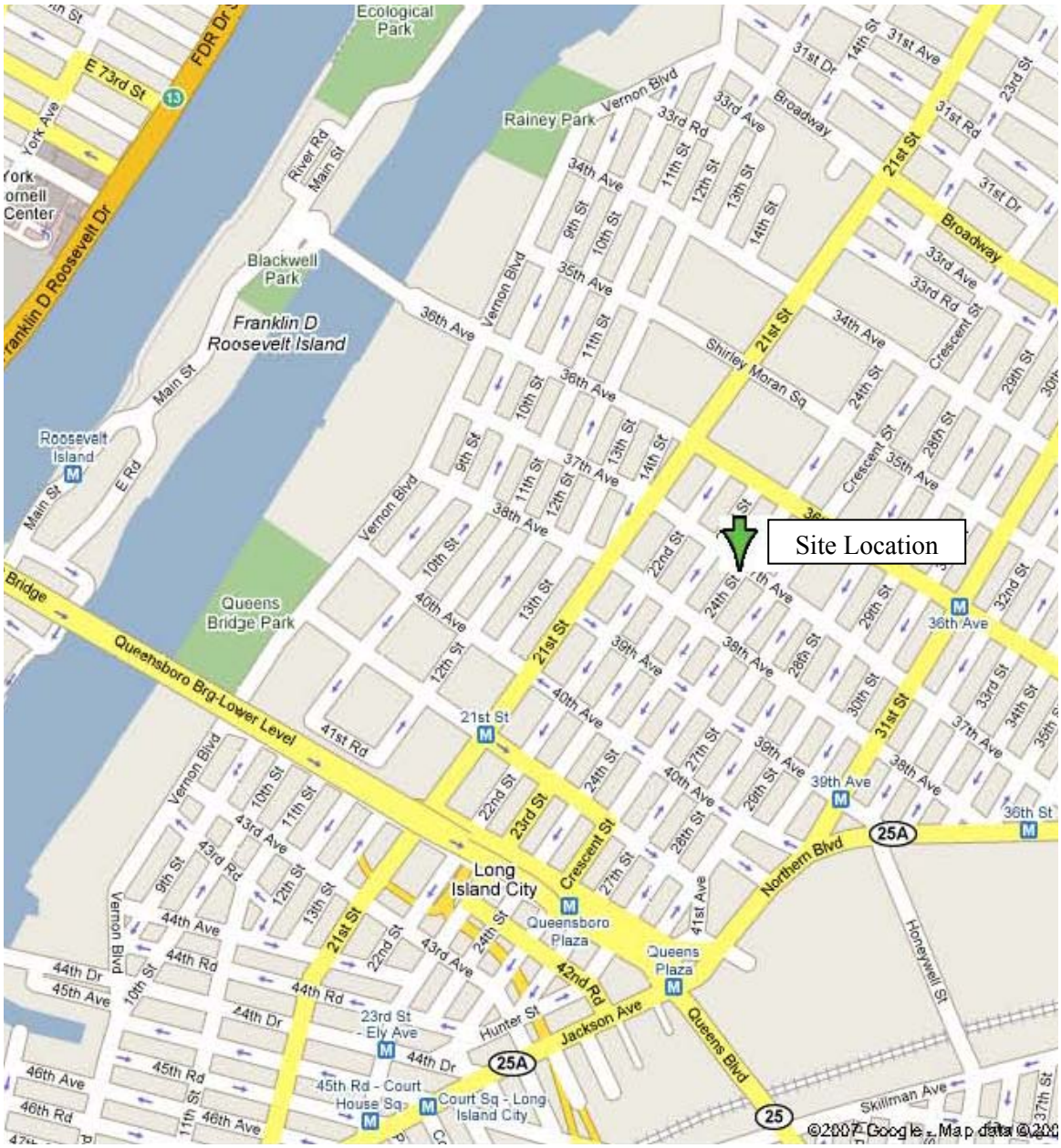
Table 2

Quality Assurance Project Plan
Jung Sun Laundry Plume

Field Sample and QA/QC Sample Off-Site Laboratory Quantity Summary

MATRIX/ANALYSIS [4]	Analytical Method	Laboratory	Reporting Limit Goal (units as specified)	Field Sample Quantity [1]	Matrix Spike (MS) or LCS [2]	MS Duplicate or Matrix Duplicate [2]	Field Duplicate	Equipment Blank	Trip Blank	Total Billable Analyses
Soil Samples										
Volatile organics	SW 846 8260B	HCV	5 µg/kg (typical) [3]	7	0	0	1	0	0	8
Groundwater Samples										
Volatile organics	SW 846 8260B	HCV	0.5 - 1.0 µg/L (typical) [5]	8	0	0	1	1	2	12

1 Soil sample quantities are estimates and actual quantity will be determined in field based on PID and MIP readings. See FAP for details.
2 Site-specific MS/MSD samples will not be submitted. MS precision and accuracy to be evaluated from batch QA/QC as required by method.
3 Reporting limits for soils, when adjusted for dry weight, will be higher. Detections above the MDL but less than reporting limits will be reported and flagged estimated (J).
4 One composite sample of each matrix (soil and water) may be analyzed for TCLP parameters as required by disposal facility; these analyses not shown on this table.
5 Previous data suggests that some samples may be highly contaminated; laboratory will screen samples and analyze at appropriate dilutions (reporting limits will be elevated for these samples).



EARTH TECH	Project: Jung Sun Laundry Plume 37-10 24th Street Long Island City, Queens, NY	Figure 1 – Site Location

APPENDIX 1

Chain of Custody Form

EarthTech
A tyco International Ltd. Company

Chain of Custody and Analytical Request

Page _____ of _____

Project Name / Site Name: Jung Sun Laundry Plume
Client Name: NYSDEC
Address/City/State:
Collected by:

Project Number: 101318
Chain of Custody Number: _____
Earth Tech Contact (Name/#) Allen Burton 973-338-6680
allen.burton@earthtech.com

					Preservative/# Bottles									**ANALYSIS**										
Field Sample ID:	Date Collected	Time Collected	Sample Depth (beginning - ending)	Sample Matrix	HCl	H2SO4	HNO3	NaOH	ZnAc/NaOH	Encore	None	Other	Comment	VOC 8260B - Std	VOC 8260B low	SVOC 8270C	TAL Metals	TO-15 Air VOCs					Cooler ID
			-																				
			-																				
			-																				
			-																				
			-																				
			-																				
			-																				
			-																				
			-																				
			-																				
			-																				
			-																				
			-																				
			-																				

Comments

Custody Transfers Prior to Receipt by Laboratory

Relinquished By (Signed)	Date	Time	Relinquished By (Signed)	Date	Time
1._____			1._____		
2._____			2._____		
3._____			3._____		

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab: _____ Shipped: Shipped: _____
Method of Shipment: _____ Airbill #: _____
Analytical Lab: _____ Location: _____
Lab Recipient: _____ Date: _____ Time: _____

APPENDIX 2

Laboratory Detection Limits and Reporting Limits

Attachment 2
Jung Sun Laundry Plume QAPP
Reporting Limits and Quantitation Limits
Volatile Organic Compounds by SW-846 Method 8260B
Hampton Clarke Veritech

Volatile Organics by SW-846 8260B	Reporting Limit (RL)		Practical Quantitation Limit (PQL)	
Compound	**Aqueous**	**Soil**	**Aqueous**	**Soil**
1,1,1,2-Tetrachloroethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,1,1-Trichloroethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,1,2,2-Tetrachloroethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,1,2-Trichloro-1,2,2-trifluoroethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,1,2-Trichloroethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,1-Dichloroethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,1-Dichloroethene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,1-Dichloropropene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,2,3-Trichlorobenzene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,2,3-Trichloropropane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,2,4-Trichlorobenzene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,2,4-Trimethylbenzene	1 ug/L	1 ug/kg	1 ug/L	1 ug/kg
1,2-Dibromo-3-Chloropropane	4 ug/L	4 ug/kg	10 ug/L	10 ug/kg
1,2-Dibromoethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,2-Dichlorobenzene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,2-Dichloroethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,2-Dichloropropane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,3,5-Trimethylbenzene	1 ug/L	1 ug/kg	1 ug/L	1 ug/kg
1,3-Dichlorobenzene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,3-Dichloropropane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,4-Dichlorobenzene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
1,4-Dioxane	150 ug/L	150 ug/kg	250 ug/L	250 ug/kg
2,2-Dichloropropane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
2-Butanone	2 ug/L	2 ug/kg	5 ug/L	5 ug/kg
2-Chloroethylvinylether	2 ug/L	2 ug/kg	5 ug/L	5 ug/kg
2-Chlorotoluene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
2-Hexanone	2 ug/L	2 ug/kg	5 ug/L	5 ug/kg
4-Chlorotoluene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
4-Isopropyltoluene	1 ug/L	1 ug/kg	1 ug/L	1 ug/kg
4-Methyl-2-Pentanone	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Acetone	10 ug/L	10 ug/kg	25 ug/L	25 ug/kg
Acrolein	5 ug/L	5 ug/kg	25 ug/L	25 ug/kg
Acrylonitrile	2 ug/L	2 ug/kg	5 ug/L	5 ug/kg
Benzene	0.5 ug/L	0.5 ug/kg	5 ug/L	5 ug/kg
Bromobenzene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Bromochloromethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Bromodichloromethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Bromoform	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Bromomethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Carbon Disulfide	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Carbon Tetrachloride	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Chlorobenzene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Chlorodifluoromethane	2 ug/L	2 ug/kg	5 ug/L	5 ug/kg
Chloroethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Chloroform	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
Chloromethane	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
cis-1,2-Dichloroethene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg
cis-1,3-Dichloropropene	1 ug/L	1 ug/kg	5 ug/L	5 ug/kg

Attachment 2
Jung Sun Laundry Plume QAPP
Reporting Limits and Quantitation Limits
Volatile Organic Compounds by SW-846 Method 8260B
Hampton Clarke Veritech

Volatile Organics by SW-846 8260B	Reporting Limit (RL)				Practical Quantitation Limit (PQL)			
Compound	**Aqueous**		**Soil**		**Aqueous**		**Soil**	
Cyclohexane	2.5	ug/L	2.5	ug/kg	5	ug/L	5	ug/kg
Dibromochloromethane	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Dibromomethane	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Dichlorodifluoromethane	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Di-isopropyl-ether	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Ethylbenzene	1	ug/L	1	ug/kg	1	ug/L	1	ug/kg
Freon 113	2	ug/L	2	ug/kg	5	ug/L	5	ug/kg
Hexachlorobutadiene	2.5	ug/L	2.5	ug/kg	5	ug/L	5	ug/kg
Iodomethane	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Isopropylbenzene	1	ug/L	1	ug/kg	1	ug/L	1	ug/kg
m&p-Xylenes	1.5	ug/L	1.5	ug/kg	1	ug/L	1	ug/kg
Methyl Acetate	1.5	ug/L	1.5	ug/kg	5	ug/L	5	ug/kg
Methylcyclohexane	1.5	ug/L	1.5	ug/kg	5	ug/L	5	ug/kg
Methylene Chloride	2.5	ug/L	2.5	ug/kg	5	ug/L	5	ug/kg
Methyl-t-butyl ether	1	ug/L	1	ug/kg	1	ug/L	1	ug/kg
Naphthalene	1	ug/L	1	ug/kg	1	ug/L	1	ug/kg
n-Butylbenzene	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
n-Hexane	2	ug/L	2	ug/kg	5	ug/L	5	ug/kg
n-Propylbenzene	1	ug/L	1	ug/kg	1	ug/L	1	ug/kg
o-Xylene	1	ug/L	1	ug/kg	1	ug/L	1	ug/kg
sec-Butylbenzene	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Styrene	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
t-Butyl Alcohol	10	ug/L	10	ug/kg	25	ug/L	25	ug/kg
t-Butylbenzene	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Tetrachloroethene	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Toluene	1	ug/L	1	ug/kg	1	ug/L	1	ug/kg
trans-1,2-Dichloroethene	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
trans-1,3-Dichloropropene	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
trans-1,4-Dichloro-2-butene	5	ug/L	5	ug/kg	5	ug/L	5	ug/kg
Trichloroethene	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Trichlorofluoromethane	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Vinyl Acetate	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg
Vinyl Chloride	1	ug/L	1	ug/kg	5	ug/L	5	ug/kg

ATTACHMENT C
HEALTH AND SAFETY PLAN

SITE CHARACTERIZATION
JUNG SUN LAUNDRY PLUME
Site Number: 241102

Work Assignment No.
D004436-11

Prepared for:

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
625 Broadway
Albany, New York 12233

December 2007

Prepared by:

Earth Tech Northeast, Inc.
300 Broadacres Drive
Bloomfield, NJ 07003-3153

HEALTH AND SAFETY PLAN APPROVAL

This Health and Safety Plan (HASP) was prepared for employees performing a specific, limited scope of work. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present on the project site. While it is not possible to discover, evaluate, and protect in advance against all possible hazards, which may be encountered during the completion of this project, adherence to the requirements of the HASP will significantly reduce the potential for occupational injury.

By signing below, I acknowledge that I have reviewed and hereby approve the HASP for the Jung Sun Laundry Plume Site. This HASP has been written for the exclusive use of Earth Tech, Inc., its employees, and subcontractors. The plan is written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Written by:

_____ _____

Celeste Foster — Date
Environmental Engineer
973-337-4209

Reviewed by:

_____

Brett D. Hodgson, OHST
Safety & Health Professional
616-940-4444

Concurrence by:

_____ _____

Claire Hunt — Date
Project Manager
973-337-4216

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APPENDICIES

1.0 INTRODUCTION

This Health and Safety Plan (HASP) provides a general description of the levels of personal protection and safe operating guidelines expected of each employee or subcontractor associated with the environmental services being conducted in the vicinity of the Jung Sun Laundry Plume Site, located at 37-10 24th Street, Long Island City, Queens, New York.

This HASP also identifies chemical and physical hazards known to be associated with the Earth Tech-managed activities addressed in this document.

HASP Supplements will be generated as necessary to address any additional activities or changes in site conditions, which may occur during field operations.

1.1 GENERAL

The provisions of this HASP are mandatory for all Earth Tech personnel engaged in fieldwork associated with the environmental services being conducted at the subject site. A copy of this HASP, any applicable HASP Supplements and the Earth Tech Consolidated Safety, Health, and Environmental (SH&E) Manual shall be maintained on site and available for review at all times. Record keeping will be maintained in accordance with this HASP and the applicable Standard Operating Procedures (SOPs). In the event of a conflict between this HASP, the SOPs and federal, state, and local regulations, workers shall follow the most stringent/protective requirements.

1.2 POLICY STATEMENT

It is the policy of Earth Tech to provide a safe and healthy work environment for all of its employees. Earth Tech considers no phase of operations or administration is of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. Every accident and every injury is avoidable. We will take every reasonable step to reduce the possibility of injury, illness, or accident. This policy is detailed in SH&E 001, *Safety, Health, and Environmental Policy Statement*. A copy of the entire *Safety, Health, and Environmental Policy Statement* will be maintained on site for reference.

The practices and procedures presented in this HASP and any supplemental documents associated with this HASP are binding on all Earth Tech employees while engaged in the subject work. In addition, all site visitors shall abide by these procedures as the minimum acceptable standard for the work site. Operational changes to this HASP and supplements that could affect the health or safety of personnel, the community, or the environment will not be made without prior approval of the Earth Tech Project Manager (PM) and the assigned Earth Tech Safety Professional.

1.3 REFERENCES

This HASP conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), *Occupational Safety and Health Standards* (with special attention to Section 120, *Hazardous Waste Operations and Emergency Response*).
- Title 29, Part 1926 of the Code of Federal Regulations (29 CFR 1926), *Safety and Health Regulations for Construction*.

- National Institute for Occupational Safety and Health (NIOSH)/OSHA/U.S. Coast Guard (USCG)/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, Publication No. 85-115, 1985.

The requirements in this HASP also conform to Earth Tech's Corporate Safety Program requirements as specified in Earth Tech's *Consolidated Safety, Health, and Environmental Manual*, a copy of which will be maintained on site at all times.

1.3.1 Earth Tech Safety, Health and Environmental Website

Earth Tech's Safety Website is located on the Earth Tech Corporate Intranet, and is available for all Earth Tech employees as a resource for safety information, updates, and procedures. Project management and employees are encouraged to visit the website for key safety items and information, such as:

- The Earth Tech Employee Orientation,
- Defensive Driver Awareness Training (DDAT)
- Contact information for Earth Tech's Safety Department staff,
- Safety Forms,
- Safety Program Manuals,
- Safety Alerts and other communications,
- Accident, Injury, and Near-Miss Reporting Requirements,
- Links to safety and regulatory information,
- Training Resources,
- Ergonomics Information, and
- A feedback link to the Earth Tech Safety Director.

The website[1] is located at the following web address:

http://etonline.earthtech.com/etonline/healthsafety/

[1] Please note that the website can only be accessed when connected to Earth Tech's Wide-Area Network (e.g., via iPass).

2.0 SITE INFORMATION AND SCOPE OF WORK

Earth Tech will conduct environmental services at the Jung Sun Laundry site. Work will be performed in accordance with the applicable Work Plans developed for the properties. Deviations from the Work Plan will require that a Safety Professional review and changes made to this HASP, to ensure adequate protection of personnel and other property.

The following is a summary of relevant data concerning the properties, and the work procedures to be performed. The Work Plan prepared by Earth Tech as a companion document to this HASP provides significantly greater details concerning both site history and planned work operations.

2.1 SITE INFORMATION

The Jung Sun Laundry Plume site (herein identified as the "site") is located at 37-10 24th Street, Long Island City, Queens, New York. Jung Sun Laundry has been in operation since the 1930s. From the late 1980s to the mid 1990s, the site was operated as a dry cleaner. The site then transitioned from dry cleaning back to laundry service. The site is currently operating as a laundry on a seven day a week, 14-hour a day schedule. Scalamandre Silks is adjacent to this site. Textile fabric manufacturing has been performed on this property since 1936. Scalamandre Silks manufacturing facility has operated on the subject property since circa the 1950s. Based on site use, it is likely that chemical dyes, paints, solvents and softening agents were used historically as part of day-to-day operations.

This site characterization will be used to identify the source of the volatile organic contamination in the groundwater, determine environmental sampling needs, and determine whether the site should be reclassified or nominated the site to the NPL.

2.2 SCOPE OF WORK

A membrane interface probe (MIP) investigation will be conducted to delineate volatile organic contamination. As many as five soil samples will be collected at areas with elevated MIP readings to identify the concentration level and confirm the presence of TCE. Three permanent monitoring wells will be installed: one in the source area defined by the MIP investigation and two upgradient from the site. A total of eight groundwater samples will be collected from the three new wells and five existing wells. If high photo-ionization detector (PID) readings are encountered during well installation, up to three soil samples may be collected.

Details of the each field activity necessary to implement this work are presented in the FAP (Attachment A to the Work Plan).

2.2.1 Geophysical Survey

Prior to commencement of the sampling and well installation, Earth Tech's drilling subcontractor will notify the New York State One Call Utility for utility clearance. However, utility clearance from One Call Utility does not cover private property. Therefore, Earth Tech will engage a geophysical subcontractor who will delineate potential subsurface utilities using electromagnetic utility locating instruments. The geophysical subcontractor will identify the location of the existing well MW-4 which is covered with soil. Monitoring well construction logs were not provided in the historical reports for the existing wells. Tthe geophysical subcontractor will use a down-hole camera to identify the location of the screened interval.

2.2.2 MIP

A MIP investigation will be conducted to characterize the TCE levels in the soil in order to identify the source area. Sixteen boring will be characterized to a depth of approximately 15 feet (above

groundwater). As many as five soil samples will be collected at areas with elevated MIP readings to identify the concentration level and confirm the presence of TCE.

2.2.3 Monitoring Well Installation

Three monitoring wells will be installed in the vicinity of the site. The wells will be installed by a drilling subcontractor with a representative from Earth Tech present. The wells will be installed using a geoprobe and pre-packaged filters.

If high PID readings are encountered up to three soil samples may be collected for laboratory analysis.

2.2.4 Site Restoration

Upon completion of the MIP investigation and monitoring well installation, the drilling subcontractor will repair the ground surface to restore the work area to its previous conditions.

2.2.5 Monitoring Well Development

Each permanent well (eight wells total) will be developed in accordance with NYSDEC protocols. A minimum of 8 hours will be allowed to pass before development occurs. Well development will be performed by a licensed well driller. The groundwater sampling will be performed no sooner than two weeks after well development.

2.2.6 Groundwater Sampling

Approximately 14 days after the installation of the three monitoring wells, Earth Tech will sample the three newly installed wells in addition to five existing wells. Groundwater samples will be collected by low flow sampling.

2.2.7 Additional Work Operations

The following additional tasks will also be performed as necessary in support of planned site activities: Refer to Appendix 1 for the associated THA.

Mobilization/Demobilization: Mobilization and demobilization represent limited pre- and post-task activities.

Utilities Identification: Various forms of aboveground/underground utility lines or pipes may be encountered during subsurface soil vapor sampling. Prior to the start of invasive site operations, all utilities must be located with the New York One Call System. Should intrusive operations come into contact with utility lines, the Site Safety Officer and the Safety Professional, defined in **Section 3.0**, will be notified immediately. Work will be suspended until the [NY] Underground Plant Protection Service is contacted and the appropriate actions for the particular situations can be taken.

Investigative-Derived Waste (IDW) Management: Soil cuttings and purge water shall be drummed analyzed to determine the appropriate disposal methods.

3.0 PROJECT HEALTH AND SAFETY ORGANIZATION

3.1 PROJECT MANAGER – CLAIRE HUNT

The Project Manager (PM) has overall management authority and responsibility for all site operations, including safety. The specific safety responsibilities for the PM are listed in Section 2.2 of SH&E 002, *Operational SH&E Structure and Responsibilities*. The PM will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations.

3.2 SAFETY PROFESSIONAL – ROBERT POLL, CIH, CSP

The Safety Professional is the member of the Earth Tech Safety, Health and Environmental Department assigned to oversee health and safety requirements for the project and provide any needed technical support. The Safety Professional will be the first point-of-contact for all of the project's health and safety matters. He, or his designee, will have the responsibility for approval of the project health and safety plan, and tracking of its implementation. He will also verify that on-site subcontractors either have their own (acceptable) HASP; or confirm in writing that the subcontractors will abide by the provisions of the Earth Tech HASP.

3.3 SITE SUPERVISOR – CELESTE FOSTER

The site supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans. The PM may act as the site supervisor while on site.

3.3.1 Responsibilities

The site supervisor is responsible to:

- Discuss deviations from the work plan with the SSO and PM.
- Discuss safety issues with the PM, SSO, and field personnel.
- Assist the SSO with the development and implementation of corrective actions for site safety deficiencies.
- Assist the SSO with the implementation of this HASP and ensuring compliance.
- Assist the SSO with inspections of the site for compliance with this HASP and applicable SOPs.

3.3.2 Authority

The site supervisor has authority to:

- Verify that all operations are in compliance with the requirements of this HASP, and halt any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the SSO, the Safety Professional, and the PM.

3.3.3 Qualifications

In addition to being HAZWOPER-qualified, the SSHO has completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4), has several years experience with health and safety at HAZWOPER sites, has participated in personal and work zone air monitoring programs at HAZWOPER sites.

3.4 SITE SAFETY OFFICER – CELESTE FOSTER

3.4.1 Responsibilities

The SSO is responsible to:

- Update the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the Safety Professional.
- Be aware of changes in Earth Tech Safety Policy. Changes are posted on the Earth Tech Safety Website (see Section 1.3 of this HASP).
- Monitor the lost time incidence rate for this project and work toward improving it.
- Inspect the site for compliance with this HASP and the SOPs.
- Work with the site supervisor and PM to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contact the Safety Professional for technical advice regarding safety issues.
- Provide a means for employees to communicate safety issues to management in a discreet manner (i.e., suggestion box, etc.).
- Determine emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Ensure that all site personnel and visitors have received the proper training and medical clearance prior to entering the site.
- Establish any necessary controlled work areas (as designated in this HASP or other safety documentation).
- Discuss potential health and safety hazards with the Site Supervisor, the Safety Professional, and the PM.
- Select an alternate SSO by name and inform him/her of their duties, in the event that the SSO must leave or is absent from the site.

3.4.2 Authority

The SSO has authority to:

- Verify that all operations are in compliance with the requirements of this HASP.
- Issue a "Stop Work Order" under the conditions set forth in Section 4.7 of this HASP.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the Safety Professional and the PM.

3.4.3 Qualifications

In addition to being HAZWOPER-qualified (see Section 4.1), the SSO is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

3.5 EMPLOYEES

3.5.1 Employee Responsibilities

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the policies and procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.

- Providing feedback to health and safety management relating to omissions and modifications in the HASP or other safety policies.
- Notifying the SSO, in writing, of unsafe conditions and acts.

3.5.2 Employee Authority

The health and safety authority of each employee assigned to the site includes the following:

- The right to refuse to work and/or stop work authority when the employee feels that the work is unsafe (including subcontractors or team contractors), or where specified safety precautions are not adequate or fully understood.
- The right to refuse to work on any site or operation where the safety procedures specified in this HASP or other safety policies are not being followed.
- The right to contact the SSO or the Safety Professional at any time to discuss potential concerns.

3.6 SUBCONTRACTORS

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in SH&E 207, *Contractor and Subcontractor SH&E Requirements*. Each Earth Tech subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE).

Earth Tech considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures, in order to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to Earth Tech for review prior to the start of onsite activities, if required.

Hazards not listed in this HASP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the Earth Tech PM or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

3.7 VISITORS

Authorized visitors (e.g., client representatives, regulators, Earth Tech management staff, etc.) requiring entry to any work location on the Site will be briefed by the PM on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and personal protective equipment which hare required for entry to any controlled work area; visitors must comply with these requirements at all times.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

4.0 SAFETY PROGRAMS

4.1 HAZWOPER QUALIFICATIONS

Personnel performing work at the job site must be qualified as HAZWOPER workers (unless otherwise noted in specific THAs or by the SSO), and must meet the medical monitoring and training requirements specified in the following safety procedures:

- SH&E 202, *Safety Meetings*
- SH&E 115, *Hazard Communication Program*
- SH&E 114, *Safety Training Programs*
- SH&E 301, *Hazardous Waste Operations (HAZWOPER)*
- SH&E 108, *SH&E Medical Monitoring and Surveillance*

Personnel must have successfully completed training meeting the provisions established in 29 CFR 1910.120 (e)(2) and (e)(3) (40-hour initial training). As appropriate, personnel must also have completed annual refresher training in accordance with 29 CFR 1910.120 (e)(8); each person's most recent training course must have been completed within the previous 365 days. Personnel must also have completed a physical exam in accordance with the requirements of 29 CFR 1910.120 (f), where the medical evaluation includes a judgment of the employee's ability to use respiratory protective equipment and to participate in hazardous waste site activities. These requirements are further discussed in SH&E 301, *Hazardous Waste Operations (HAZWOPER)*.

If site monitoring procedures indicate that a possible exposure has occurred above the OSHA permissible exposure limit (PEL), employees may be required to receive supplemental medical testing to document specific to the particular materials present.

4.2 SITE-SPECIFIC SAFETY TRAINING

All personnel performing field activities at the site will be trained in accordance with SH&E 114, *Safety Training Programs*. For this project, training will include the requirements specified in the following:

1. SH&E 202, *Safety Meetings*
2. SH&E 115, *Hazard Communication Program*
3. SH&E 109, *Hearing Conservation*
4. SH&E 113, *Personal Protective Equipment*
5. SH&E 116, *Driver and Vehicle Safety*
6. SH&E 204, *Task Hazard Analyses*
7. SH&E 205, *Emergency Action Planning and Prevention*

For this project, the training required to perform work includes:

1. HAZWOPER 40-hour and current 8-hour refresher,
2. Hearing Conservation,
3. First Aid/CPR training (at least one person on site).

In addition to the general health and safety training programs, personnel will be:

- Instructed on the contents of applicable portions of this HASP and any supplemental health and safety information developed for the tasks to be performed.
- Informed about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure and heat stress.
- Made aware of task-specific physical hazards and other hazards that may be encountered during site work. This includes any client-specific required training for health and safety.
- Made aware of fire prevention measures, fire extinguishing methods, and evacuation procedures.

The site-specific training will be performed prior to the worker performing the subject task or handling the impacted materials and on an as-needed basis thereafter. Training will be conducted by the SSO (or his/her designee) and will be documented on the form attached to SH&E 202, *Safety Meetings*.

4.2.1 Competent-Person Training Requirements

No OSHA-designated competent persons will be required for this project.

4.3 HAZARD COMMUNICATION

Section 5.2 provides information concerning the materials that may be encountered as environmental contaminants during the work activities. In addition, any organization wishing to bring any hazardous material onto any Earth Tech-controlled work site must first provide a copy of the item's Material Safety Data Sheet (MSDS) to the SSO for approval and filing (the SSO will maintain copies of all MSDSs on site). MSDSs may not be available for locally-obtained products, in which case some alternate form of product hazard documentation will be acceptable. In accordance with the requirements of SH&E 115, *Hazard Communication Program*, all personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDSs.

All containers [if any] on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

Appendix 2 provides copies of MSDS for those items planned to be brought on site at the time this HASP is prepared. This information will be updated as required during site operations.

4.4 CONFINED SPACE ENTRY

No confined space entry is expected for this project. Should confined space entry be required, the following information will apply: The SSO/site supervisor shall identify all potential confined spaces in accordance with SH&E 118, *Confined Space Entry Program*. In addition, the SSO/site supervisor will inform all employees of the location of confined spaces. Confined space entry procedures and training requirements are listed in SH&E 118.

4.5 HAZARDOUS, SOLID, OR MUNICIPAL WASTE

If hazardous, solid, and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, and/or local regulations.

4.6 GENERAL SAFETY RULES

All site personnel shall adhere to SH&E 201, *General Safety Rules*, during site operations. In addition, the housekeeping, sanitation, and personal hygiene requirements in SH&E 208, *General Housekeeping, Hygiene, and Sanitation* will observed. Specific excerpts from SH&E 208 are listed below.

4.6.1 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials.

4.6.2 Smoking, Eating, or Drinking

Smoking, eating and drinking will not be permitted inside any controlled work area at any time. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking). Consumption of alcoholic beverages is prohibited at any Earth Tech site.

4.6.3 Buddy System

All field personnel will use the buddy system when working within any controlled work area. Personnel belonging to another organization on site can serve as "buddies" for Earth Tech personnel. Under no circumstances will any employee be present alone in a controlled work area.

4.6.4 Heat and Cold Stress

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. For additional requirements, refer to SH&E 124, *Heat Stress Prevention Program*.

Heat stress can be a significant field site hazard, particularly for non-acclimated personnel operating in a hot, humid setting. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties. Work-rest cycles will be determined and the appropriate measures taken to prevent heat stress as outlined in SH&E 124, *Heat Stress Prevention Program*.

Responding to Heat-Related Illness

The guidance below will be used in identifying and treating heat-related illness.

Table 4-1: Identification and Treatment of Heat-Related Illness

Type of Heat-Related Illness	Description	First Aid
Mild Heat Strain	The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.	Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. If an air-conditioned spot is available, this is an ideal break location. Once the victim shows improvement, he/she may resume working; however, the work pace should be moderated to prevent recurrence of the symptoms.
Heat Exhaustion	Usually begins with muscular weakness and cramping, dizziness, staggering gait, and nausea. The victim will have pale, clammy moist skin and may perspire profusely. The pulse is weak and fast and the victim may faint unless they lie down. The bowels may move involuntarily.	Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling). Remove all protective outerwear. Call a physician. Treat the victim for shock. (Make the victim lie down, raise his or her feet 6–12 inches, and keep him or her cool by loosening all clothing). If the victim is conscious, it may be helpful to give him or her sips of water. Transport victim to a medical facility as soon as possible.

Type of Heat-Related Illness	Description	First Aid
Heat Stroke	The most serious of heat illness, heat stroke represents the collapse of the body's cooling mechanisms. As a result, body temperature may rise to 104 degrees Fahrenheit or higher. As the victim progresses toward heat stroke, symptoms such as headache, dizziness, nausea can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly and death is imminent if exposure continues. Heat stroke can occur suddenly.	Immediately evacuate the victim to a cool and shady area. Remove all protective outerwear and as much personal clothing as decency permits. Lay the victim on his or her back with the feet slightly elevated. Apply cold wet towels or ice bags to the head, armpits, and thighs. Sponge off the bare skin with cool water or rubbing alcohol, if available. The main objective is to cool without chilling the victim. Give no stimulants or hot drinks. Since heat stroke is a severe medical condition requiring professional medical attention, emergency medical help should be summoned immediately to provide onsite treatment of the victim and proper transport to a medical facility.

Solar Protection

To protect against exposure to solar radiation, workers will observe the following requirements:

1. All workers will wear sunglass-type safety glasses at all times when working outdoors during daylight hours.
2. Workers will utilize a commercial sunblock with a minimum solar protection factor (SPF) of 15.

4.7 USE OF UTILITY KNIVES OR OTHER OPEN-BLADED CUTTING TOOLS

All utility knives with manually retracting blades (including "pocket knives" and other "collapsible, open-blade cutting tools") are no longer permitted on any Earth Tech jobsite, unless specifically authorized on a task-specific basis in this HASP and associated THA. The only acceptable type of utility knife will be those with automatically retracting blades. Other "cutters" must be equipped with a completely enclosed and guarded blade. Additional recommendations regarding the use of cutting tools can be found in SH&E 506, *Manual Hand Tools*.

4.8 STOP WORK AUTHORITY

All employees have the right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions. Whenever the SSO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, immediate resolution with the appropriate supervisor

shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the SSO is authorized and required to stop work, which shall be immediately binding on all affected Earth Tech employees and subcontractors.

Upon issuing the stop work order, the SSO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective; however, operations shall not resume until the Safety Professional has concurred that workplace conditions meet acceptable safety standards.

4.9 CLIENT SPECIFIC SAFETY REQUIREMENTS

The client has specified no additional health and safety requirements.

5.0 HAZARD ASSESSMENT

5.1 TASK HAZARD ANALYSIS

Task hazard analysis (THA) is a technique used to identify hazards and hazard controls associated with a specific job function. THAs focus on the relationship between the workers, the task, the resources required to complete the task, and the work environment. These variables must be evaluated to identify the potential hazards associated with the task. Once identified, steps can be taken to eliminate, reduce, or control the hazards to an acceptable risk level. Guidelines for developing THAs are located in SH&E 204, *Task Hazard Analyses*.

Section 2.2 describes the work activities anticipated to be performed during this project. Individual THAs for the tasks associated with this work can be found in Appendix 1.

5.1.1 Unanticipated Work Activities/Conditions

Operations at the site may require additional tasks not identified in Section 2.2 or addressed in Appendix 1 THAs. Before performing any task not covered in this HASP a THA must be prepared, and approved by the Safety Professional.

5.2 ENVIRONMENTAL CONTAMINANT EXPOSURE HAZARDS

The following is a discussion of the hazards presented to worker personnel during this project from on-site chemical hazards known or suspected to be present on site. Hazards associated with chemical products brought to the site during work operations are addressed separately, under the Hazard Communication process described in Section 4.3.

Exposure symptoms and applicable first aid information for each suspected site contaminant are listed in the MSDS sheets in Appendix 2.

Tetrachloroethylene (PCE)

PCE affects the CNS, causing loss of coordination, headache, vertigo (loss of balance), light narcosis, dizziness, and unconsciousness. Death may occur if exposed to extremely high concentrations of PCE. Various irritable effects have been attributed to PCE exposure, including eye, nose, and throat irritation, indications of nausea and intestinal gas, and possible changes to the liver and kidneys. PCE is not known to produce harmful effects in cases of skin exposure where the PCE was allowed to evaporate immediately after contact. However, in cases where skin was exposed to PCE frequently and for prolonged periods without evaporating, symptoms of dermatitis by defatting of the skin was evident. The National Toxicology Program (NTP) lists PCE as an anticipated human carcinogen. The OSHA PEL and the ACGIH TLV are 25 ppm with an ACGIH short-term exposure limit (STEL) of 100 ppm.

Trichloroethylene (TCE)

Moderate exposures to TCE cause symptoms similar to those of alcohol inebriation. Higher concentrations cause narcotic effects. Ventricular fibrillation has been cited as the cause of death following heavy exposures. TCE-induced hepatocellular carcinomas have been detected in mice during tests conducted by the National Cancer Institute. Organ systems affected by overexposure to TCE are the CNS (euphoria, analgesia, and anesthesia), degeneration of the liver and kidneys, the lungs (tachypnea), heart (arrhythmia) and skin (irritation, vesication, and paralysis of fingers when immersed in liquid TCE). Contact with the liquid defats the skin, causing topical dermatitis. Certain people appear to experience synergistic effects from TCE exposure concomitant with exposure to caffeine, alcohol, and other drugs. Other reported symptoms of TCE exposure include abnormal fatigue, headache, irritability, gastric disturbances, and intolerance to alcohol. Both the OSHA PEL and the ACGIH STEL are 100 ppm, and the ACGIH TLV is 50 ppm.

Vinyl Chloride

Inhaling high concentrations causes mild symptoms of drowsiness, blurred vision, staggering gate and tingling and numbness in the extremities. Liquid vinyl chloride may cause severe irritation or burns on skin or eye contact. Several workers who handled and used vinyl chloride developed a rare form of liver cancer. IARC, NTP and OSHA all list vinyl chloride as a carcinogen. Persons in ill health where such illness would be aggravated by exposure to vinyl chloride should not be allowed to work with or handle this product.

Diesel Exhaust

When diesel fuel burns in an engine, the resulting exhaust is made up of soot and gases representing thousands of different chemical substances. 90 percent of the soot consists of particles that can be inhaled and deposited in the lungs. These particles may carry absorbed polynuclear aromatic hydrocarbons. The gases in diesel exhaust can also create health problems include:

- nitrous oxide
- nitrogen dioxide
- formaldehyde
- benzene
- sulfur dioxide
- hydrogen sulfide
- carbon dioxide
- carbon monoxide

Short-term symptoms of diesel exhaust exposure may include: irritation of the eyes, nose and throat, lightheadedness, and headaches. Chronic effects of exposure to diesel exhaust possibly include cancer.

5.2.1 Assessment of Exposure Hazards

Inhalation – No significant airborne concentration of contaminants is expected at the site, hence air monitoring is not required at the site.

Skin Contact – Drilling and other activities can produce contaminated wastes possessing significant concentrations of contaminants. This material can cause exposures to unprotected skin; therefore all handling of potentially contaminated materials will require the use of appropriate skin protection.

Ingestion – Protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas (see Section 8.2).

5.3 PHYSICAL HAZARDS

Physical hazards anticipated on this site include: heat or cold stress environments, which may be associated with site-specific work activities, PPE usage and geographical project locations. Site work may include: heavy lifting 49lb. Rule, slips/tripsfalls, protruding objects, hazardous noise, poor lighting in basements, severe weather, flying debris from drilling/hammering, and possibly confined spaces.

5.4 RADIOLOGICAL HAZARDS

No radioactive materials are known or suspected to be present on site.

6.0 ACTIVITY SPECIFIC REQUIREMENTS

6.1 SUPPLEMENTAL SAFETY PROCEDURES

As discussed in Section 5.0, personnel may be exposed to a variety of chemical, physical, radiological, and biological hazards resulting from task- or equipment-specific activities. The requirements for the control of many of these hazards is discussed in SOPs found in the 400 and 500 Series of the Consolidated Safety, Health, and Environmental Manual.

Specific procedures applicable to this project include:

- SH&E 403 – Hammer Drilling
- SH&E 404 - Manual Lifting
- SH&E 506 - Manual Hand Tools

In addition, the following supplemental procedures have been developed to address requirements not covered within the established Earth Tech SOPs (SH&E 400/500-series). SOPs and supplemental procedures are specified on a task-specific basis in the individual THAs found in Appendix 1.

6.1.1 Biological Hazards

Contact with animals, insects, and plants can cause injury and illness to personnel. Care must be taken to ensure that these types of injuries are avoided. Some examples of biological hazards include:

1. Wild animals, such as snakes, raccoons, squirrels, and rats. These animals not only can bite and scratch, but can carry transmittable diseases (e.g., rabies). Avoid the animals whenever possible. If bitten, go to the nearest medical facility.
2. Insects such as mosquitoes, ticks, bees, and wasps. Mosquitoes can potentially carry and transmit the West Nile Virus. Ticks can transmit Lyme disease or Rocky Mountain Spotted Fever. Bees and wasps can sting by injecting venom, which causes some individuals to experience anaphylactic shock (extreme allergic reaction). Whenever you will enter areas that provide a habitat for insects (e.g., grass areas, woods), wear light-colored clothing, long pants and shirt, and spray exposed skin areas with a DEET-containing repellent. Keep away from high grass wherever possible. Keep your eyes and ears open for bee and wasp nests. If bitten by insects, see a doctor if there is any question of an allergic reaction.
3. Plants such as poison ivy and poison oak can cause severe rashes on exposed skin. Be careful where you walk, wear long pants, and minimize touching exposed skin with your hands after walking through thickly vegetated areas until after you have thoroughly washed your hands with soap and water.

    1. SH&E 607, *Biohazards*
    2. SH&E 608, Blood-borne Pathogens

6.1.2 Vehicle Operations

Site vehicles present serious hazards to site personnel. Blind spots, failure to yield, and other situations may cause vehicles to come into contact with personnel. To reduce the possibility of contact between equipment/traffic and personnel, always adhere to the following:

- Personnel must wear a high visibility, reflective safety vest at all times when working near heavy equipment and/or other vehicle traffic.

- Personnel must always yield to equipment/vehicle traffic and stay at least 100 feet away from all equipment/vehicle traffic. Always maintain eye contact with operators.
- When feasible, place barriers between work areas and equipment/vehicle traffic.
- Always ensure reverse warning alarms are working and louder than surrounding noise. Personnel must report inoperative reverse warning alarms IMMEDIATELY.

6.1.3 Manual Lifting

Most materials associated with investigation and remedial activities are moved by hand. The human body is subject to severe damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process. Whenever possible, use at least two people to lift, or roll/lift with your arms as close to the body as possible. Under no circumstances should any one person lift more than 49 pounds unassisted. For additional requirements refer to SH&E - 404, *Manual Lifting*.

6.1.4 Utilities

Various forms of underground/overhead utility lines or pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. Should intrusive operations cause equipment to come into contact with utility lines, the SSO and an Earth Tech SH&E Professional will be notified immediately. Work will be suspended until the applicable utility agency is contacted and the appropriate actions for the particular situations can be taken. For this site, the applicable agency is NYC One Call. The phone number is provided in the Emergency Contacts list found in Section 8. For additional requirements, refer to SH&E 402, *Excavation & Trenching*; SH&E 403, *Hammer Drilling*; and SH&E 310, *Overhead Electrical Lines*.

6.1.5 Slips, Trips, Falls, and Protruding Objects

A variety of conditions may exist that may result in injury from slips, trips, falls, and protruding objects. Slips and trips may occur as a result of wet, slippery, or uneven walking surfaces. To prevent injuries from slips and trips, always keep work areas clean; keep walkways free of objects and debris; and report/clean up liquid spills. Serious injuries may occur as a result of falls from elevated heights. Always wear fall protection while working at heights of 6 feet or greater above the next lower level. Protruding objects are any object that extends into the path of travel or working area that may cause injury when contacted by personnel. Always be aware of protruding objects and when feasible remove or label the protruding object with an appropriate warning.

6.1.6 Electrical and Powered Equipment

Electrical and powered equipment may be used during a variety of site activities. Injuries associated with electrical and powered equipment include electric shock, cuts/lacerations, eye damage (from flying debris), and burns. To reduce the potential of injury from the hazards associated with electrical and powered equipment, always comply with the following:

- Wear ANSI-approved (Z87.1) safety glasses. Faceshields may be required to provide additional face protection from flying debris.
- Wear appropriate work gloves. Work gloves may reduce the severity of burns and cuts/lacerations.
- Use ground fault circuit interrupters (GFCIs) when using electrical powered tools/equipment. GFCIs prevent electrical shock by detecting the loss of electricity from a power cord and/or electrical device.
- Use lockout/tagout procedures when performing maintenance or repairs on equipment.

6.1.7 Noise

Hazardous noise may be produced during site activities by heavy equipment, powered tools, and other equipment or operations. Refer to SH&E 109, *Hearing Conservation Program* for requirements regarding hazardous noise and hearing protection.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 PERSONAL PROTECTIVE EQUIPMENT

The purpose of personal protective equipment (PPE) is to provide a barrier, which will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. SH&E 113, *Personal Protective Equipment (PPE)*, lists the general requirements for selection and usage of PPE. Table 7-1 lists the minimum PPE required during site operations and additional PPE that may be necessary. The specific PPE requirements for each work task are specified in the individual THAs found in Appendix 1.

By signing this HASP you are agreeing that you have been properly trained in the use, limitations, care and maintenance of the protective equipment you will use at this project. If you have not received training on the proper use, care, and, limitations of the PPE required for this project, please see the PM/SSO for the proper training prior to signing this HASP.

Table 7-1: Personal Protective Equipment

TYPE	MATERIAL	ADDITIONAL INFORMATION
Minimum PPE:		
Safety Vest	High-visibility	Must have reflective tape and be visible from all sides
Boots	Leather	ANSI approved safety toe
Safety Glasses		ANSI Approved
Hard Hat		ANSI Approved
Work Uniform		No shorts/cutoff jeans or sleeveless shirts
Additional PPE:		
Hearing Protection	Ear plugs and/ or muffs	In hazardous noise areas
Leather Gloves		If working with sharp objects or powered equipment.
Protective Chemical Boots		Required for any potential exposure to free product.

7.2 DECONTAMINATION

All requirements for performing personal and equipment decontamination may be found in SH&E 604, *Decontaminatio*n.

7.3 PPE DOFFING AND DONNING INFORMATION

The following information is to provide field personnel with hel pful hints that, when applied, make donning and doffing of PPE a more safe and manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the booty and the underlying sturdy leather work boot, resulting in significant cuts to the legs/ankles. Recommend using a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the booty, then proceed by manually tearing the material down to the sole of the booty for easy removal.

- When applying duct tape to PPE interfaces (wrist, lower leg etc.) and zippers, leave approximately one inch at the end of the tape to fold over onto itself. This will make it much easier to remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE.
- Have a "buddy" check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation.
- Never perform personal decontamination with a pressure washer.

Table 7-2: Action Levels During Environmental Services

Parameter	Location and Interval	Response Level (meter units/ppm above background)	Response
Hydrocarbons (Total by PID)	Workers breathing zone immediately after drilling the hole for sub-slab sampling.	≤ 10 ppm	Continue Level D or Modified Level D work and continue monitoring.
		>10 ppm – 100 ppm	Upgrade to Level C PPE (minimum full-face APR with GMA cartridges or equivalent). Continue environmental monitoring.
		≥ 100 ppm	Cease work, exit the area, contact the SSO or SH&E Manager for guidance.

8.0 SITE CONTROL

8.1 GENERAL

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established directly prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps, posted in the support vehicle or trailer and discussed during the daily safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made.

8.2 CONTROLLED WORK AREAS

Each HAZWOPER controlled work area will consist of the following zone:

- Exclusion Zone: Contaminated work area.

8.2.1 Exclusion Zone

The Exclusion Zone is the area where primary activities occur, such as sampling, and cleanup work. This area must be clearly marked with hazard tape, barricades or cones, or enclosed by fences or ropes. Only personnel involved in work activities, and meeting the requirements specified in the applicable THA and Sections 4.1 and 4.2, will be allowed in an Exclusion Zone.

The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample collection activities. To meet this requirement, the following minimum distances will be used:

- **Hammer Drilling**. A distance of 10 feet will be cleared in all directions from the sampling location in order to accommodate additional sampling equipment.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the Exclusion Zone and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

8.3 SITE ACCESS DOCUMENTATION

If implemented by the PM, all personnel entering the site shall complete the "Site Entry/Exit Log" located at the site trailer or primary site support vehicle.

8.3.1 Visitor Access

Visitors to any HAZWOPER controlled-work area must comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

1. A written confirmation must be received by Earth Tech documenting that each of the visitors has received the proper training and medical monitoring required by this HASP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.

2. Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.
3. All visitors must be escorted by an Earth Tech employee.

If the site visitor requires entry to any Exclusion Zone, but does not comply with the above requirements, all work activities within the Exclusion Zone must be suspended. Until these requirements have been met, entry will not be permitted.

8.4 SITE SECURITY

Site security is necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards.
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site.
- Prevent theft.
- Avoid interference with safe working procedures.

To maintain site security during working hours:

1. Maintain security in the Support Zone and at access control points.
2. Establish an identification system to identify authorized persons and limitations to their approved activities.
3. Assign responsibility for enforcing authority for entry and exit requirements.
4. When feasible, install fencing or other physical barrier around the site.
5. If the site is not fenced, post signs around the perimeter and whenever possible, use guards to patrol the perimeter. Guards must be fully apprised of the hazards involved and trained in emergency procedures.
6. Have the PM approve all visitors to the site. Make sure they have valid purpose for entering the site. Have trained site personnel accompany visitors at all times and provide them with the appropriate protective equipment.

To maintain site security during off-duty hours:

1. If possible, assign trained, in-house technicians for site surveillance. They will be familiar with the site, the nature of the work, the site's hazards, and respiratory protection techniques.
2. If necessary, use security guards to patrol the site boundary. Such personnel may be less expensive than trained technicians, but will be more difficult to train in safety procedures and will be less confident in reacting to problems around hazardous substances.
3. Enlist public enforcement agencies, such as the local police department, if the site presents a significant risk to local health and safety.
4. Secure the equipment.

9.0 EMERGENCY RESPONSE PLANNING

9.1 EMERGENCY ACTION PLAN

Although the potential for an emergency to occur is remote, an emergency action plan has been prepared for this project should such critical situations arise. The only significant type of onsite emergency that may occur is physical injury or illness to a member of the Earth Tech team. The Emergency Action Plan (EAP) will be reviewed by all personnel prior to the start of field activities. A test of the EAP will be performed within the first three (3) days of the project field operations. This test will be evaluated and documented in the project records.

Three major categories of emergencies could occur during site operations:

1. Illnesses and physical injuries (including injury-causing chemical exposure)
2. Catastrophic events (fire, explosion, earthquake, or chemical)
3. Safety equipment problems

9.1.1 Emergency Response Coordinator

Prior to beginning site activities, the PM will complete Table 9-2 by filling in the names of the Emergency Coordinator (EC) and the alternate EC. The duties of the EC and the alternate EC have been specified in SH&E 003.

9.1.2 Site-Specific Emergency Procedures

Prior to the start of site operations, the EC will complete Table 9-1 with any site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures.

Table 9-1: Emergency Planning (To be completed by SSO prior to start of site operations at safety orientation/initial briefing)

Emergency	Evacuation Route	Muster Location
Fire/Explosion	• TBD	• TBD
Tornado	• TBD	• TBD
Lightning	• TBD	• Vehicle
Additional Information		
Communication Procedures	Verbal: cell phones as necessary	
CPR/First Aid Trained Personnel	TBD	

9.1.3 Accident/Incident Reporting

All accidents and incidents that occur on-site during any field activity will be promptly reported to the SSO and the Site Supervisor in accordance with SH&E 101, *Injury, Illness, and Near-Miss Reporting*, or the appropriate District-level incident reporting procedures (i.e., Near-Miss Reporting Program).

If any Earth Tech employee is injured and requires medical treatment, the Site Supervisor will contact **Earth Tech's Incident Reporting Line at (800) 348-5046 immediately**. The Site Supervisor will initiate a written report, using the ***Supervisor's Report of Incident*** form (see SH&E 101). The Site

Supervisor will complete the first two sections of this form and forward to the PM for completion of Section 3. The report will then be provided to the Safety Professional before the end of the following shift.

If any employee of a subcontractor is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures; however, copies of all documentation (which at a minimum must include the OSHA Form 301 or equivalent) must be provided to the SSO within 24 hours after the accident has occurred.

All accidents/incidents will be investigated in accordance with SH&E 102, *Incident Investigation & Review*. Copies of all subcontractor accident investigations, whether accomplished in accordance with their own procedures or SH&E 102, will be provided to the SSO within five (5) days of the accident/incident.

Table 9-2 Emergency Contact Information

Emergency Coordinators / Key Personnel			
Name	**Title/Workstation**	**Telephone Number**	**Mobile Phone**
Incident Reporting	Incident Reporting Line	(800) 348-5046	
Sadique Ahmed	NYSDEC Project Manager/ Client Contact	(518) 402-9775 (Office)	
Claire Hunt	Project Manager	(973) 337-4216 (Office)	
Celeste Foster	Site Supervisor/SSHO	(973) 337-4209 (Office)	(646) 729-5784
Robert Poll, CIH	Safety and Health Manager	(518) 951-2200 (Office)	(518) 817-3089
Mike Thiagaram	Primary Emergency Coordinator	(973) 337-4242 (Office)	

Organization / Agency	
Name	**Telephone Number**
Police Department (local)	911
Fire Department (local)	911
State Police	911
Ambulance Service ***(EMT will determine appropriate hospital for treatment)***	911
Non-Emergency Hospital ***(Use by site personnel is only for non-emergency cases)***	
Poison Control Center	(800) 222-1222
Pollution Emergency	(800) 292-4706
National Response Center	(800) 424-8802
Chem-Tel	(800) 424-9300
Title 3 Hotline	(800) 535-0202

10.0 PERSONNEL ACKNOWLEDGEMENT

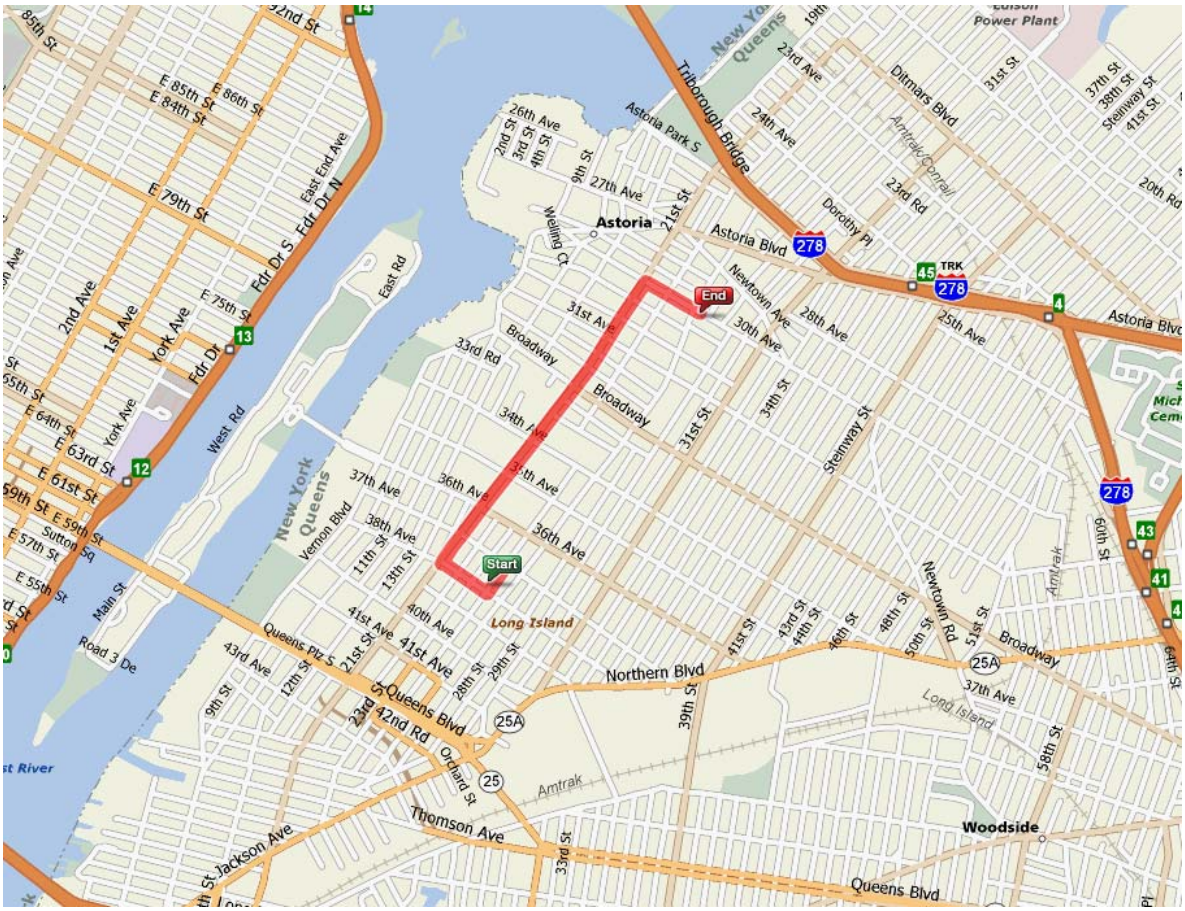
By signing below, the undersigned acknowledges that he/she has read and reviewed the Earth Tech Health and Safety Plan for the Utility Manufacturing/Wonder King site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein.

PRINT NAME	SIGNATURE	ORGANIZATION	DATE

Figure No: 1
Hospital Route Map

Start: 37-10 24th St, Long Island City, NY 11101
End: Mount Sinai Hospital of Queens, 25-10 30th Avenue, Long Island City, Queens, New York 11102 Tel: 1-718-932-1000
Total Distance: 1.48 miles
Estimated Total Time: 5 minutes

Directions	**Miles**
Start out going SOUTHWEST on 24TH ST toward 38TH AVE	<0.1 miles
Turn RIGHT onto 38TH AVE.	0.1 miles
Turn RIGHT onto 21ST ST.	1 mile
Turn RIGHT onto 30TH AVE.	0.1 miles
End at Mount Sinai Hospital of Queens	



Appendix 1

Task Hazard Analysis

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EARTH TECH, INC.
SOIL VAPOR INTRUSION & GROUNDWATER EVALUATION – JS CLEANERS
TASK HAZARD ANALYSIS

ADMINISTRATIVE INFORMATION

Job/Task Name: Geophysical Survey

Project Name: Soil Vapor Intrusion & Groundwater Evaluation Jung Sun Laundry Plume Site	Project Location: 37-10 24th Street Long Island City, Queens, New York
Project Manager: Claire Hunt	Analysis Performed By: Bob Poll, CIH, CSP
Date Job/Task to be performed: December 2007	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB EVENT SEQUENCE

LIST ONE STEP OF THE JOB FOR EACH LINE. (*ATTACH ADDITIONAL JOB EVENT SEQUENCE FORM(S) AS NECESSARY*)

1. Visually evaluate work area to identify landmarks	6.
2. Perform geophysical testing at designated locations	7.
3. Locate MW-4	8.
4. Perform downhole inspection (perform monitoring)	9.
5.	10.

CHEMICAL HAZARDS (*SELECT*) ☒ INH ☐ ING ☐ SKIN CONT.

- ☐ Asbestos
- ☐ Acids
- ☐ Caustics
- ☒ Chlorinated hydrocarbons (TCE)
- ☐ Lead
- ☐ Gasoline or diesel fuel
- ☐ BTEX
- ☐ Jet fuel (JP-4, JP-5, JP-8)
- ☐ PCBs
- ☐ Cadmium
- ☐ Compressed gases/asphyxiants
- ☐ PAHs
- ☐ Welding fumes
- ☐ Hydrogen sulfide
- ☐ Other metals
- ☐ Bunker fuel/oil
- ☐ Explosives (TNT)
- ☐ Dust
- ☐ Dioxins
- ☐ Pesticides/Herbicides
- ☐ MTBE
- ☐ Methylene chloride
- ☐ Waste oil
- ☐ Hydraulic fluid
- ☐ Petroleum hydrocarbons

PHYSICAL HAZARDS

- ☐ Electricity/High voltage
- ☐ Elevated work areas (fall hazard)
- ☐ Manual materials handling/Back
- ☐ OE/UXO
- ☐ Hand tool usage
- ☐ Power tool usage
- ☐ Heavy equipment operations
- ☐ Drill rig (HSA, DP, Air Rotary)
- ☐ Excavations (engulfment/collapse)
- ☐ Confined space entry
- ☐ Ionizing radiation
- ☒ Eye hazards (impact, light, etc.)
- ☒ Slips, trips, and falls
- ☐ Hazardous noise
- ☐ Heat or cold stress
- ☐ Oxygen-deficient atmosphere
- ☐ Oxygen-enriched atmosphere
- ☐ Explosive atmosphere
- ☐ Powder-actuated tools
- ☒ Vehicular traffic

Other Chemical/Physical Hazards (*List*): _____

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☐ Rubber (safety-toe)
- ☒ Leather (safety-toe)

General:
- ☐ Coveralls _____(*type*)
- ☐ Hearing protection (plugs/muffs)
- ☐ FF APR _____(*cartridges*)
- ☐ ½-face APR _____(*cartridges*)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

Eye Protection:
- ☐ Faceshield
- ☒ Safety glasses or goggles
- ☐ Welder's helmet/goggles

Gloves:
- ☐ Chemically-protective _____(*type*)
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*): ANSI Type 2 Traffic Safety Vest

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

- ☒ Fire ext. 1A:10B:C (*rating*)
- ☒ First-aid kit
- ☐ Dust control/mitigation
- ☐ Portable eyewash
- ☐ Fire watch
- ☒ Traffic control measures

Other (*List*): _____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Geophysics instruments

APPLICABLE SOPS (SEE HASP/SSHP/APP)

SH&E 201, *General Safety Rules*

TRAINING REQUIREMENTS

None

ADMINISTRATIVE INFORMATION	
Job/Task Name: Geophysical Survey	
Project Name: Soil Vapor Intrusion & Groundwater Evaluation Jung Sun Laundry Plume Site	Project Location: 37-10 24th Street Long Island City, Queens, New York
Project Manager: Claire Hunt	Analysis Performed By: Bob Poll, CIH, CSP
Date Job/Task to be performed: December 2007	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL REQUIREMENTS

Implement the following traffic safety procedure:

Establish a work area at least 10 feet in all directions from well location, using work vehicles and warning devices to delineate the perimeter.

- Park the largest on-site vehicle so that it forms a barrier with the nearest on-coming traffic.
- Park any additional vehicles to enclose the remainder of the work area as much as possible.
- Utilize cones and Yellow “CAUTION” tape to enclose openings between vehicles and on uncovered sides of the perimeter, such that there is a continuous enclose around the entire work area.
    - Traffic cones must be orange, and at least 4 feet in height.

MONITORING PROCEDURES

Upon opening any well which has been sealed for more than 1 hour, use a PID to check VOC concentrations at the well opening. If levels exceed 100 ppm, allow the well to ventilate for at least 15 minutes and re-test. Repeat as necessary until readings fall below 100 ppm.

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EARTH TECH, INC.
SOIL VAPOR INTRUSION & GROUNDWATER EVALUATION – JS CLEANERS
TASK HAZARD ANALYSIS

ADMINISTRATIVE INFORMATION

Job/Task Name: GeoProbe Drilling/Sampling

Project Name: Soil Vapor Intrusion & Groundwater Evaluation Jung Sun Laundry Plume Site	Project Location: 37-10 24th Street Long Island City, Queens, New York
Project Manager: Claire Hunt	Analysis Performed By: Bob Poll, CIH, CSP
Date Job/Task to be performed: December 2007	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB EVENT SEQUENCE

LIST ONE STEP OF THE JOB FOR EACH LINE. (*ATTACH ADDITIONAL JOB EVENT SEQUENCE FORM(S) AS NECESSARY*)

1. Identify the sampling location	6. Install GW well
2. Position the GeoProbe rig and est. traffic perimeter	7.
3. Perform GeoProbe drilling	8.
4. Monitor MIP concurrent with probe insertion	9.
5. Collect soil samples	10.

CHEMICAL HAZARDS (*SELECT*) ☒ INH ☐ ING ☒ SKIN CONT.

- ☐ Asbestos
- ☐ Acids
- ☐ Caustics
- ☒ Chlorinated hydrocarbons (TCE)
- ☐ Lead
- ☐ Gasoline or diesel fuel
- ☐ BTEX
- ☐ Jet fuel (JP-4, JP-5, JP-8)
- ☐ PCBs
- ☐ Cadmium
- ☐ Compressed gases/asphyxiants
- ☐ PAHs
- ☐ Welding fumes
- ☐ Hydrogen sulfide
- ☐ Other metals
- ☐ Bunker fuel/oil
- ☐ Explosives (TNT)
- ☐ Dust
- ☐ Dioxins
- ☐ Pesticides/Herbicides
- ☐ MTBE
- ☐ Methylene chloride
- ☐ Waste oil
- ☐ Hydraulic fluid
- ☐ Petroleum hydrocarbons

PHYSICAL HAZARDS

- ☐ Electricity/High voltage
- ☐ Elevated work areas (fall hazard)
- ☒ Manual materials handling/Back
- ☐ OE/UXO
- ☒ Hand tool usage
- ☐ Power tool usage
- ☐ Heavy equipment operations
- ☐ Drill rig (HSA, DP, Air Rotary)
- ☐ Excavations (engulfment/collapse)
- ☐ Confined space entry
- ☐ Ionizing radiation
- ☒ Eye hazards (impact, light, etc.)
- ☒ Slips, trips, and falls
- ☒ Hazardous noise
- ☐ Heat or cold stress
- ☐ Oxygen-deficient atmosphere
- ☐ Oxygen-enriched atmosphere
- ☐ Explosive atmosphere
- ☐ Powder-actuated tools
- ☒ Vehicular traffic

Other Chemical/Physical Hazards (*List*): _____

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☐ Rubber (safety-toe)
- ☒ Leather (safety-toe)

General:
- ☐ Coveralls _____(*type*)
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR _____(*cartridges*)
- ☐ ½-face APR _____(*cartridges*)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

Eye Protection:
- ☐ Faceshield
- ☒ Safety glasses or goggles
- ☐ Welder's helmet/goggles

Gloves:
- ☒ Chemically-protective - N-DEX or equivalent nitrile
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*): ANSI Type 2 Traffic Safety Vest

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

- ☒ Fire ext. 1A:10B:C (*rating*)
- ☒ First-aid kit
- ☐ Dust control/mitigation
- ☐ Portable eyewash
- ☐ Fire watch
- ☒ Traffic control measures

Other (*List*): _____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	

APPLICABLE SOPS (SEE HASP/SSHP/APP)

SH&E 201, *General Safety Rules*

SH&E 113, *Personal Protective Equipment*

TRAINING REQUIREMENTS

None

ADMINISTRATIVE INFORMATION	
Job/Task Name: GeoProbe Drilling/Sampling	
Project Name: Soil Vapor Intrusion & Groundwater Evaluation Jung Sun Laundry Plume Site	Project Location: 37-10 24th Street Long Island City, Queens, New York
Project Manager: Claire Hunt	Analysis Performed By: Bob Poll, CIH, CSP
Date Job/Task to be performed: December 2007	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL REQUIREMENTS

Implement the following traffic safety procedure:

Establish a work area at least 10 feet in all directions from well location, using work vehicles and warning devices to delineate the perimeter.

- Position the GeoProbe rig so that it is facing towards the direction of the nearest on-coming traffic.
- Park the support vehicles and ET vehicles to enclose the remainder of the work area as much as possible.
- Utilize cones and Yellow "CAUTION" tape to enclose openings between vehicles and on uncovered sides of the perimeter, such that there is a continuous enclose around the entire work area.
    - Traffic cones must be orange, and at least 4 feet in height.

MONITORING PROCEDURES

No monitoring required.

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EARTH TECH, INC.
SOIL VAPOR INTRUSION & GROUNDWATER EVALUATION – JS CLEANERS
TASK HAZARD ANALYSIS

ADMINISTRATIVE INFORMATION

Job/Task Name: Site Restoration

Project Name: Soil Vapor Intrusion & Groundwater Evaluation Jung Sun Laundry Plume Site	Project Location: 37-10 24th Street Long Island City, Queens, New York
Project Manager: Claire Hunt	Analysis Performed By: Bob Poll, CIH, CSP
Date Job/Task to be performed: December 2007	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB EVENT SEQUENCE

LIST ONE STEP OF THE JOB FOR EACH LINE. (*ATTACH ADDITIONAL JOB EVENT SEQUENCE FORM(S) AS NECESSARY*)

1. Apply concrete or other patch material	6.
2. Containerize and remove any trash	7.
3.	8.
4.	9.
5.	10.

CHEMICAL HAZARDS (*SELECT*) ☐ INH ☐ ING ☐ SKIN CONT.

- ☐ Asbestos
- ☐ Acids
- ☐ Caustics
- ☐ Chlorinated hydrocarbons (TCE)
- ☐ Lead
- ☐ Gasoline or diesel fuel
- ☐ BTEX
- ☐ Jet fuel (JP-4, JP-5, JP-8)
- ☐ PCBs
- ☐ Cadmium
- ☐ Compressed gases/asphyxiants
- ☐ PAHs
- ☐ Welding fumes
- ☐ Hydrogen sulfide
- ☐ Other metals
- ☐ Bunker fuel/oil
- ☐ Explosives (TNT)
- ☐ Dust
- ☐ Dioxins
- ☐ Pesticides/Herbicides
- ☐ MTBE
- ☐ Methylene chloride
- ☐ Waste oil
- ☐ Hydraulic fluid
- ☐ Petroleum hydrocarbons

PHYSICAL HAZARDS

- ☐ Electricity/High voltage
- ☐ Elevated work areas (fall hazard)
- ☐ Manual materials handling/Back
- ☐ OE/UXO
- ☐ Hand tool usage
- ☐ Power tool usage
- ☐ Heavy equipment operations
- ☐ Drill rig (HSA, DP, Air Rotary)
- ☐ Excavations (engulfment/collapse)
- ☐ Confined space entry
- ☐ Ionizing radiation
- ☒ Eye hazards (impact, light, etc.)
- ☒ Slips, trips, and falls
- ☐ Hazardous noise
- ☐ Heat or cold stress
- ☐ Oxygen-deficient atmosphere
- ☐ Oxygen-enriched atmosphere
- ☐ Explosive atmosphere
- ☐ Powder-actuated tools
- ☒ Vehicular traffic

Other Chemical/Physical Hazards (*List*): Use of concrete/asphalt patch material

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☐ Rubber (safety-toe)
- ☒ Leather (safety-toe)

General:
- ☐ Coveralls _____(*type*)
- ☐ Hearing protection (plugs/muffs)
- ☐ FF APR _____(*cartridges*)
- ☐ ½-face APR _____(*cartridges*)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

Eye Protection:
- ☐ Faceshield
- ☒ Safety glasses or goggles
- ☐ Welder's helmet/goggles

Gloves:
- ☐ Chemically-protective _____(*type*)
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*): ANSI Type 2 Traffic Safety Vest

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

- ☒ Fire ext. 1A:10B:C (*rating*)
- ☒ First-aid kit
- ☐ Dust control/mitigation
- ☐ Portable eyewash
- ☐ Fire watch
- ☒ Traffic control measures

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	

APPLICABLE SOPS (SEE HASP/SSHP/APP)

SH&E 201, *General Safety Rules*

TRAINING REQUIREMENTS

None

ADMINISTRATIVE INFORMATION	
Job/Task Name: Site Restoration	
Project Name: Soil Vapor Intrusion & Groundwater Evaluation Jung Sun Laundry Plume Site	Project Location: 37-10 24th Street Long Island City, Queens, New York
Project Manager: Claire Hunt	Analysis Performed By: Bob Poll, CIH, CSP
Date Job/Task to be performed: December 2007	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL REQUIREMENTS

Implement the following traffic safety procedure:

Establish a work area at least 10 feet in all directions from well location, using work vehicles and warning devices to delineate the perimeter.

- Park the largest on-site vehicle so that it forms a barrier with the nearest on-coming traffic.
- Park any additional vehicles to enclose the remainder of the work area as much as possible.
- Utilize cones and Yellow "CAUTION" tape to enclose openings between vehicles and on uncovered sides of the perimeter, such that there is a continuous enclose around the entire work area.
    - Traffic cones must be orange, and at least 4 feet in height.

MONITORING PROCEDURES

No monitoring required

EarthTech
A Tyco International Ltd. Company

EARTH TECH, INC.
SOIL VAPOR INTRUSION & GROUNDWATER EVALUATION – JS CLEANERS
TASK HAZARD ANALYSIS

ADMINISTRATIVE INFORMATION

Job/Task Name: Monitoring Well Development & Well Sampling

Project Name: Soil Vapor Intrusion & Groundwater Evaluation Jung Sun Laundry Plume Site	Project Location: 37-10 24th Street Long Island City, Queens, New York
Project Manager: Claire Hunt	Analysis Performed By: Bob Poll, CIH, CSP
Date Job/Task to be performed: December 2007	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB EVENT SEQUENCE

LIST ONE STEP OF THE JOB FOR EACH LINE. (*ATTACH ADDITIONAL JOB EVENT SEQUENCE FORM(S) AS NECESSARY*)

1. Open well	6.
2. Clean/surge as needed (development only)	7.
3. Purge as required per QA procedure	8.
4. Collect sample in sample container	9.
5. Collect any IDW and dispose	10.

CHEMICAL HAZARDS (*SELECT*) ☒ INH ☐ ING ☒ SKIN CONT.

- ☐ Asbestos
- ☐ Acids
- ☐ Caustics
- ☒ Chlorinated hydrocarbons (TCE)
- ☐ Lead
- ☐ Gasoline or diesel fuel
- ☐ BTEX
- ☐ Jet fuel (JP-4, JP-5, JP-8)
- ☐ PCBs
- ☐ Cadmium
- ☐ Compressed gases/asphyxiants
- ☐ PAHs
- ☐ Welding fumes
- ☐ Hydrogen sulfide
- ☐ Other metals
- ☐ Bunker fuel/oil
- ☐ Explosives (TNT)
- ☐ Dust
- ☐ Dioxins
- ☐ Pesticides/Herbicides
- ☐ MTBE
- ☐ Methylene chloride
- ☐ Waste oil
- ☐ Hydraulic fluid
- ☐ Petroleum hydrocarbons

PHYSICAL HAZARDS

- ☐ Electricity/High voltage
- ☐ Elevated work areas (fall hazard)
- ☒ Manual materials handling/Back
- ☐ OE/UXO
- ☒ Hand tool usage
- ☐ Power tool usage
- ☐ Heavy equipment operations
- ☐ Drill rig (HSA, DP, Air Rotary)
- ☐ Excavations (engulfment/collapse)
- ☐ Confined space entry
- ☐ Ionizing radiation
- ☒ Eye hazards (impact, light, etc.)
- ☒ Slips, trips, and falls
- ☐ Hazardous noise
- ☐ Heat or cold stress
- ☐ Oxygen-deficient atmosphere
- ☐ Oxygen-enriched atmosphere
- ☐ Explosive atmosphere
- ☐ Powder-actuated tools
- ☒ Vehicular traffic

Other Chemical/Physical Hazards (*List*): _____

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- ☐ Hearing protection (plugs/muffs)
- ☐ FF APR _____(*cartridges*)
- ☐ ½-face APR _____(*cartridges*)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

Eye Protection:
- ☐ Faceshield
- ☒ Safety glasses or goggles
- ☐ Welder's helmet/goggles

Gloves:
- ☒ Chemically-protective - N-DEX or equivalent nitrile
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*): ANSI Type 2 Traffic Safety Vest

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

- ☒ Fire ext. 1A:10B:C (*rating*)
- ☒ First-aid kit
- ☐ Dust control/mitigation
- ☐ Portable eyewash
- ☐ Fire watch
- ☒ Traffic control measures

Other (*List*): _____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	

APPLICABLE SOPS (SEE HASP/SSHP/APP)

SH&E 201, *General Safety Rules*

SH&E 113, *Personal Protective Equipment*

TRAINING REQUIREMENTS

None

ADMINISTRATIVE INFORMATION	
Job/Task Name: Monitoring Well Development & Well Sampling	
Project Name: Soil Vapor Intrusion & Groundwater Evaluation Jung Sun Laundry Plume Site	Project Location: 37-10 24th Street Long Island City, Queens, New York
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Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL REQUIREMENTS

Implement the following traffic safety procedure:

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- Park any additional vehicles to enclose the remainder of the work area as much as possible.
- Utilize cones and Yellow "CAUTION" tape to enclose openings between vehicles and on uncovered sides of the perimeter, such that there is a continuous enclose around the entire work area.
    - Traffic cones must be orange, and at least 4 feet in height.

MONITORING PROCEDURES

Upon opening any well which has been sealed for more than 1 hour, use a PID to check VOC concentrations at the well opening. If levels exceed 100 ppm, allow the well to ventilate for at least 15 minutes and re-test. Repeat as necessary until readings fall below 100 ppm.

Appendix 2

Material Safety Data Sheet

International Chemical Safety Cards

1,1,1-TRICHLOROETHANE

ICSC: 0079

Methyl chloroform
Methyltrichloromethane
alpha-Trichloroethane
$C_2H_3Cl_3$ / CCl_3CH_3
Molecular mass: 133.4

ICSC # 0079
CAS # 71-55-6
RTECS # KJ2975000
UN # 2831
EC # 602-013-00-2
October 27, 1994 Peer reviewe

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions. Heating will cause rise in pressure with risk of bursting. See Notes. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Headache. Dizziness. Drowsiness. Nausea. Ataxia. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Diarrhoea. Nausea. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Collect leaking and spilled liquid in sealable, suitable containers as far as possible. Absorb remaining liquid in sand or inert	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs and incompatible materials . See Chemical Dangers.	Do not transport with food and feedstuffs. Marine pollutant. Note: F

absorbent and remove to safe place. Do NOT let this chemical enter the environment. Personal protection: self-contained breathing apparatus.	Cool. Dry. Ventilation along the floor.	Xn symbol N symbol R: 20-59 S: 2-24/25-59-61 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0079

International Chemical Safety Cards

1,1,1-TRICHLOROETHANE

ICSC: 0079

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air.

CHEMICAL DANGERS:
The substance decomposes on heating or on burning producing toxic and corrosive fumes including phosgene and hydrogen chloride. Reacts violently with aluminium, manganese and their alloys, alkalis, strong oxidants, acetone and zinc. Attacks natural rubber. Mixtures of 1,1,1-trichloroethane with potassium or its alloys are shock sensitive. Reacts slowly with water releasing corrosive hydrochloric acid.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 350 ppm as TWA, 450 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued (ACGIH 2004).
MAK: 200 ppm, 1100 mg/m³; Peak limitation category: II(1); skin absorption (H); Pregnancy risk group: C; (DFG 2004).
OSHA PEL†: TWA 350 ppm (1900 mg/m^3)
NIOSH REL: C 350 ppm (1900 mg/m^3) 15-minute See Appendix C (Chloroethanes)
NIOSH IDLH: 700 ppm See: 71556

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes , the skin and the respiratory tract . The substance may cause effects on the heart, central nervous system and liver , resulting in cardiac disorders and respiratory failure . Exposure at high levels may result in death. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the liver.

PHYSICAL PROPERTIES

Boiling point: 74°C
Melting point: -30°C
Relative density (water = 1): 1.34
Solubility in water: none
Vapour pressure, kPa at 20°C: 13.3
Relative vapour density (air = 1): 4.6
Flash point: see Notes
Auto-ignition temperature: 537°C
Explosive limits, vol% in air: 8-16
Octanol/water partition coefficient as log Pow: 2.49

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to air quality and ground water contamination.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions. The substance burns only in excess oxygen or if a strong source of ignition is present. Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is suggested. An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert. Do NOT use in the vicinity of a fire or a hot surface, or during welding. Aerothene, Algylen, Trichloran, Chlorylen, Genklene, Chlorothene NU, Chlorothene VG, and Solvent 111 are trade names. Card has been partly updated in April 2005. See section Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-61S2831
NFPA Code: H2; F1; R0

ADDITIONAL INFORMATION

ICSC: 0079 **1,1,1-TRICHLOROETHANE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSDS Name: Acetone

Catalog Numbers: A11 1, A11 20, A11 200, A11 4, A11-1, A11-20, A11-200, A11-4, A11S 4, A11S-4, A16P 4, A16P-4, A16S 20, A16S 20 001, A16S 4, A16S-20, A16S-4, A18 1, A18 20, A18 200, A18 200 001, A18 4, A18 500, A18-1, A18-20, A18-200 A18-4, A18-500, A18S 4, A18S-4, A18SK 4, A18SK-4, A18SS 200, A18SS 50, A18SS-115, A18SS-200, A18SS-30, A18SS-50, A19 1, A19 4, A19-1, A19-4, A20-1 A40 4, A40-4, A928 4, A929 4, A929-1, A929-4, A930-4, A946 4, A946-4, A949 1, A949 4, A949-1, A949-4, A949SK-1, A949SK-4, A949SS 115, A949SS 200, A949SS 30, A949SS 50, A949SS-11, A949SS-115, A949SS-20, A949SS-200, A949SS-30, A949SS-50, HC 300 1GAL, S70090, S70091, S70091-1

Synonyms: Dimethylformaldehyde, dimethyl ketone, 2-propanone, pyroacetic acid, pyroacetic ether

Company Identification:

Generic Chemicals
10 Park Avenue
Anywhere Idaho 11111

For information, call: 111-111-1111	Emergency Number: 222-222-2222
For CHEMTREC assistance, call: 800-424-9300	

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

CAS#	Chemical Name	%	Einecs#
67-64-1	2-propanone	99	200-662-2

SECTION 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance: Colorless, highly volatile liquid with a sweetish odor. Danger! Extremely flammable liquid FP=-4F (-20C). Causes irritation to eyes, skin, and respiratory tract. Causes central nervous system depression. May cause liver and kidney damage. Toxic effects are enhanced by ethanol.

Target Organs: Kidneys, central nervous system, liver, respiratory system.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury.

Skin: Exposure may cause irritation characterized by redness, dryness, and inflammation.

Ingestion: May cause irritation of the digestive tract. May cause central nervous system depression, kidney damage, and liver damage. Symptoms may include: headache, excitement, fatigue, nausea, vomiting, stupor, and coma.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause liver and kidney damage. May cause motor incoordination and speech abnormalities.

Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation may cause effects similar to those of acute inhalation.

SECTION 4 - FIRST AID MEASURES

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.

Skin: Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.

Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.

Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician: Treat symptomatically and supportively. No specific antidote exists.

SECTION 5 - FIRE FIGHTING MEASURES

General Information: Containers may build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool.

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam.

Autoignition Temperature: 33oF (0.56oC)

Flash Point: -4oF (-20.00oC)

Explosion Limits: Lower = 2.5; Upper = 12.8

SECTION 6 - ACCIDENTAL RELEASE MEASURES

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Wear appropriate protective clothing to minimize contact with skin. Remove all sources of ignition.

SECTION 7 - HANDLING and STORAGE

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, sparks or open flames.

Storage: Keep away from sources of ignition. Store in a tightly closed container.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Exposure Limits

Chemical Name	ACGIH		NIOSH	OSHA final PELs
2-propanone	750 ppm	100 ppm STEL	250 ppm TWA	1000 ppm TWA
	1780 mg/m3	2380 mg/m3 STEL	590 mg/m3 TWA	2400 mg/m3 TWA

OSHA Vacated PELs: 2-propanone: 750 ppm TWA; 1800 mg/m3 TWA; 1000 ppm STEL; 2400 mg/m3 STEL

Personal Protective Equipment

Eyes: Wear chemical goggles and face shield.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear polyethylene gloves, apron, and/or clothing.

Respirators: Follow the OSHA respirator regulations found in 29CFR 1010.134. Always use a NIOSH-approved respirator when necessary.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Colorless, highly volatile liquid.
Odor	Sweetish
pH	7
Vapor Pressure	180 mm Hg
Vapor Density	2.0 (Air=1)
Evaporation Rate	7.7 (n-Butyl acetate=1)
Viscosity	Not available

Boiling Point	133.2oF
Freeze/Melt Point	-139.6oF
Decomp Temp	Not available
Solubility	Not available
Specific Gravity	0.79 (Water=1)
Molecular Formula	C3H6O
Molecular Weight	58.0414

SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability: Stable.
Conditions to Avoid: High temperatures, temperatures above 220_C.
Incompatibilities with Other Materials: Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid+sulfuric acid, chromic anhydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol+hydrogen peroxide.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

SECTION 11 - TOXICOLOGICAL INFORMATION

RTECS#: CAS# 67-64-1: AL3150000
LD50/LC50: CAS# 67-64-1: Inhalation, rat: LC50 =50100 mg/m3/8H; Oral, mouse: LD50 = 3 gm/kg; Oral, rabbit: LD50 = 5340 mg/kg; Oral, rat: LD50 = 5800 mg/kg; Skin, rabbit: LD50 = 20 gm/kg.
Carcinogenicity: 2-propanone - Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: Fertility: post-implantation mortality. Ihl, mam: TCLo=31500 ug/m3/24H (1-13D preg)
Neurotoxicity: No information available.
Mutagenicity: Cytogenetic analysis: hamster fibroblast, 40 g/L, Sex chromosome loss/non-disjunction: S.cerevisiae, 47600 ppm
Other Studies: None.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: Rainbow trout LC50=5540 mg/L/96H; Sunfish (tap water), death at 14250 ppm/24H; Mosquito fish (turbid water) TLm=13000 ppm/48H
Environmental Fate: Volatilizes, leeches, and biodegrades when released to soil.
Physical/Chemical: No information available.

SECTION 13 - DISPOSAL CONSIDERATIONS

Dispose of in a manner consistent with federal, state, and local regulations.
RCRA D-Series Maximum Concentration of Contaminants: Not listed.
RCRA D-Series Chronic Toxicity Reference Levels: Not listed.
RCRA F-Series: Not listed.
RCRA P-Series: Not listed.
RCRA U-Series: waste number U002 (Ignitable waste)

This material is banned from land disposal according to RCRA.

SECTION 14 - TRANSPORT INFORMATION

US DOT	IMO	IATA	RID/ADR	Canadian TDG
Shipping Name: ACETONE	Shipping Name: ACETONE	Shipping Name: ACETONE	Shipping Name: ACETONE	Shipping Name: ACETONE
Hazard Class: 3	Hazard Class: 3.1	Hazard Class: 3	Dangerous Goods Code: 3(3B)	Hazard Class: 3
UN Number: UN1090	UN Number: 1090	UN Number: 1090	UN Number: 1090	UN Number: UN1090
Packing Group: II	Packing Group: 2	Packing Group: 2		Other Information: FLASHPOINT -20 C

SECTION 15 - REGULATORY INFORMATION

A. Federal

TSCA	CAS# 67-64-1 is listed on the TSCA inventory. None of the chemicals are on the Health & Safety Reporting List. None of the chemicals in this product are under a Chemical Test Rule. None of the chemicals are listed under TSCA Section 12b. None of the chemicals in this material have a SNUR under TSCA.
CERCLA/ SARA	None of the chemicals in this material have an RQ. None of the chemicals in this product have a TPQ. This material contains 2-propanone (CAS# 67-64-1, 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act	This material does not contain any hazardous air pollutants, any Class 1 Ozone depletors, nor any Class 2 Ozone depletors
Clean Water Act	None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA	None of the chemicals in this product are considered highly hazardous by OSHA

Exposure Limits: OEL-AUSTRALIA:TWA 500 ppm (1185 mg/m3);STEL 1000 ppm. OEL-AUSTRIA:TWA 750 ppm (1780 mg/m3). OEL-BELGIUM:TWA 750 ppm (1780 mg/m3);STEL 1000 pp. OEL-CZECHOSLOVAKIA:TWA 800 mg/m3;STEL 4000 mg/m3. OEL-DENMARK:TWA 250 ppm (600 mg/m3). OEL-FINLAND:TWA 500 ppm (1200 mg/m3);STEL 625 ppm (1500 mg/m3). OEL-FRANCE:TWA 750 ppm (1800 mg/m3). OEL-GERMANY:TWA 1000 ppm (2400 mg/m3). OEL-HUNGARY:TWA 600 mg/m3;STEL 1200 mg/m3. OEL-INDIA:TWA 750 ppm (1780 mg/m3);STEL 1000 ppm (2375 mg/m3). OEL-JAPAN:TWA 200 ppm (470 mg/m3). OEL-THE NETHERLANDS:TWA 750 ppm (1780 mg/m3) JAN9. OEL-THE PHILIPPINES:TWA 1000 ppm (2400 mg/m3). OEL-POLAND:TWA 200 mg/m3. OEL-RUSSIA:TWA 200 ppm;STEL 200 mg/m3. OEL-SWEDEN:TWA 250 ppm (600 mg/m3);STEL 500 ppm (1200 mg/m3). OEL-SWITZERLAND:TWA 750 ppm (1780 mg/m3). OEL-TURKEY:TWA 1000 ppm (2400 mg/m3). OEL-UNITED KINGDOM:TWA 1000 ppm (2400 mg/m3);STEL 1250 ppm. OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV. OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

SECTION 16 - ADDITIONAL INFORMATION

Additional Information: No additional information available. MSDS Creation Date: November 1994. The information above is believed to be accurate and represents the best information currently available. However, no warranty is made of merchantability, or any other warranty, express or implied, with respect to such information, and no liability resulting from its use is assumed. Users must make their own investigations to determine the suitability of the information for their particular purposes

NIOSH Publication No. 2005-151:

NIOSH Pocket Guide to Chemical Hazards

Acetone

CAS 67-64

$(CH_3)_2CO$

RTECS AL

Synonyms & Trade Names
Dimethyl ketone, Ketone propane, 2-Propanone

DOT ID &
1090 127

Exposure Limits

NIOSH REL: TWA 250 ppm (590 mg/m^3)

OSHA PEL†: TWA 1000 ppm (2400 mg/m^3)

IDLH 2500 ppm [10%LEL] See: 67641

Conversion 1 ppm = 2.38 mg/m^3

Physical Description
Colorless liquid with a fragrant, mint-like odor.

MW: 58.1	BP: 133°F	FRZ: -140°F	Sol: Miscible
VP: 180 mmHg	IP: 9.69 eV		Sp.Gr: 0.79
Fl.P: 0°F	UEL: 12.8%	LEL: 2.5%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
Oxidizers, acids

Measurement Methods
NIOSH 1300, 2555, 3800; OSHA 69
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH
Up to 2500 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic va
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-dema
pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other p
mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic va
appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system

See also: INTRODUCTION See ICSC CARD: 0087 See MEDICAL TESTS: 0002

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NIOSH Publication No. 2005-151:

NIOSH Pocket Guide to Chemical Hazards

Tetrachloroethylene

CAS 127-1

$Cl_2C=CCl_2$

RTECS KX

Synonyms & Trade Names
Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene

DOT ID &
1897 160

Exposure Limits

NIOSH REL: Ca Minimize workplace exposure concentrations. See Appendix A

OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any

IDLH Ca [150 ppm] See: 127184

Conversion 1 ppm = 6.78 mg/m^3

Physical Description
Colorless liquid with a mild, chloroform-like odor.

MW: 165.8	BP: 250°F	FRZ: -2°F	Sol: 0.02%
VP: 14 mmHg	IP: 9.32 eV		Sp.Gr: 1.62
Fl.P: NA	UEL: NA	LEL: NA	

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Incompatibilities & Reactivities
Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potas

Measurement Methods
NIOSH 1003; OSHA 1001
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demai pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other p mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic va appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordinatic drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system

Cancer Site [in animals: liver tumors]

See also: INTRODUCTION See ICSC CARD: 0076 See MEDICAL TESTS: 0179

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NIOSH Safety and Health Topic:

Trichloroethylene

Trichloro
Trichlo
All Chemica

NIOSH Resources

NIOSH Pocket Guide to Chemical Hazards
DHHS (NIOSH) Publication No. 97-140
Exposure limits, Respirator Recommendations, First Aid, more...
The Pocket Guide is a source of general industrial hygiene information on several hundred chemicals/classes found in the work environment. Key data provided for each chemical/substance includes name (including synonyms/trade names), structure/formula, CAS/RTECS Numbers, DOT ID, conversion factors, exposure limits, IDLH, chemical and physical properties, measurement methods, personal protection, respirator recommendations, symptoms, and first aid.

- **Trichloroethylene** (CAS No. 79-01-6)

International Chemical Safety Cards
An ICSC summarizes essential health and safety information on chemicals for their use at the "shop floor" level by workers and employers in factories, agriculture, construction and other work places.

- **Trichloroethylene (1,1,2-Trichloroethylene, Trichloroethene, Ethylene trichloride, Acetylene trichloride)**

Documentation for Immediately Dangerous to Life or Health Concentrations (IDLH)
The IDLH documents the criteria and information sources that have been used by NIOSH to determine immediately dangerous to life or health concentrations.

- **Trichloroethylene**

NIOSH Manual of Analytical Methods (NMAM)
NMAM is a collection of methods for sampling and analysis of contaminants in workplace air, and in the blood and urine of workers who are occupationally exposed.

- Trichloroethylene (No. 1022) **PDF only** 22 kb (4 pages)
- Trichloroethylene by port GC (No. 3701) **PDF only** 17 kb (3 pages)

The free Adobe Acrobat Reader software is required to view the methods linked above.

NIOSH Criteria Documents: Special Occupational Hazard Review With Control Recommendations: Trichloroethylene
DHHS (NIOSH) Publication No. 78-130 (1978)
The purpose of Special Occupational Hazard Reviews is to analyze and document the health problems asoociated with a given agent or industrial process, and to recommend engineering controls and work practices to ameliorate these problems.

Current Intelligence Bulletin 2: Trichloroethylene (TCE)
DHHS (NIOSH) Publication No. 78-127 (1975)
Presents information about Trichloroethylene as well as recommendation to treat formaldehyde as a carcinogen.

NIOSH Criteria Documents: Criteria for a Recommended Standard: Occupational Exposure to Trichloroethylene
DHHS (NIOSH) Publication No. 73-11025 (1973)
Presents a standard to prevent the adverse effects of exposure to Trichloroethylene over a working lifetime.

Related Resources

Toxicological Profile for Trichloroethylene (ATSDR)
External Link: http://www.atsdr.cdc.gov/toxprofiles/tp19.html

Consumer Factsheet on: Trichloroethylene (EPA)
This is a factsheet about a chemical that may be found in some public or private drinking water supplies. It may cause health problems if found in amounts greater than the health standard set by the United States Environmental Protection Agency (EPA).
External Link: http://www.epa.gov/safewater/dwh/c-voc/trichlor.html

Toxnet
A search engine accessing several databases provided by the National Library of Medicine.
External Link: http://toxnet.nlm.nih.gov

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NIOSH Publication No. 2005-151:

NIOSH Pocket Guide to Chemical Hazards

Toluene

CAS 108-8

$C_6H_5CH_3$

RTECS XS

Synonyms & Trade Names
Methyl benzene, Methyl benzol, Phenyl methane, Toluol

DOT ID &
1294 130

Exposure Limits	**NIOSH REL**: TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3)
	OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)

IDLH 500 ppm See: 108883

Conversion 1 ppm = 3.77 mg/m^3

Physical Description
Colorless liquid with a sweet, pungent, benzene-like odor.

MW: 92.1	BP: 232°F	FRZ: -139°F	Sol(74°F): 0.
VP: 21 mmHg	IP: 8.82 eV		Sp.Gr: 0.87
Fl.P: 40°F	UEL: 7.1%	LEL: 1.1%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
Strong oxidizers

Measurement Methods
NIOSH 1500, 1501, 3800, 4000; OSHA 111
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH
Up to 500 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic va
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-dema pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other p mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic va appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dila lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

See also: INTRODUCTION See ICSC CARD: 0078 See MEDICAL TESTS: 0232

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International Chemical Safety Cards

m-XYLENE

ICSC: 0085

meta-Xylene
1,3-Dimethylbenzene
m-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0085
CAS # 108-38-3
RTECS # ZE2275000
UN # 1307
EC # 601-022-00-9
March 08, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator	Fireproof. Separated from strong oxidants and strong acids .	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

for organic gases and vapours.)

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0085

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

m-XYLENE

ICSC: 0085

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts with strong acids and strong oxidants .

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001). BEI specified by (ACGIH 2001).
EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000).
OSHA PEL†: TWA 100 ppm (435 mg/m^3)
NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3)
NIOSH IDLH: 900 ppm See: 95476

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the skin . The substance may cause effects on the central nervous system . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system .Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 139°C
Melting point: -48°C
Relative density (water = 1): 0.86
Solubility in water: none
Vapour pressure, kPa at 20°C: 0.8
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 27°C c.c.
Auto-ignition temperature: 527°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.20

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0086 p-Xylene.

NFPA Code: H 2; F 3; R 0;

Transport Emergency Card: TEC (R)-30S1307-III

ADDITIONAL INFORMATION

ICSC: 0085 **m-XYLENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

Linde Gas

Linde Gas LLC (216) 642-6600
P.O. Box 94737
Cleveland, Ohio 44101
www.us.lindegas.com

MATERIAL
SAFETY
DATA SHEET

No. 155

PRODUCT NAME Vinyl Chloride		**CAS #**	75-01-4
TRADE NAME AND SYNONYMS Vinyl chloride, inhibited (D.O.T.)		**DOT I.D. No.:**	UN 1086; RQ 1.0 (0.454)
CHEMICAL NAME AND SYNONYMS Vinyl Chloride, Chloroethylene; Chloroethene		**DOT Hazard Class:**	Division 2.1
		Formula	C_2H_3Cl or CH_2CHC
ISSUE DATES AND REVISIONS Revised january 1995		**Chemical Family:**	Halogenated Alkene

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

TWA = 5 molar ppm with an A1 Carcinogen Rating (ACGIH 1994-1995). Al is a confirmed human carcinogen. OSHA 1993. 1910.1017, 8 Hr. TWA = 1 Molar PPM (Continued on Page 4)

SYMPTOMS OF EXPOSURE

Inhaling high concentrations causes mild symptoms of drowsiness, blurred vision, staggering gate and tingling and numbness in the extremities.

Liquid vinyl chloride may cause severe irritation or burns on skin or eye contact.

TOXICOLOGICAL PROPERTIES

Several workers who handled and used vinyl chloride developed a rare form of liver cancer.

IARC, NTP and OSHA all list vinyl chloride as a carcinogen.

Persons in ill health where such illness would be aggravated by exposure to vinyl chloride should not be allowed to work with or handle this product.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO VINYL CHLORIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given assisted respiration and supplemental oxygen. Further treatment should be symptomatic and supportive.

(Continued an Page 4)

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Vinyl chloride polymerizes on exposure to sunlight, heat or in the presence of oxygen or air. The addition of phenol or hydroquinone inhibits the polymerization. It is flammable in air.

PHYSICAL DATA

BOILING POINT 7.3ºF (-13.7ºC)	**LIQUID DENSITY AT BOILING POINT** 60.6 lb/ft^3 (971 kg/m^3)
VAPOR PRESSURE @ 70ºF (21.1ºC) = 52 psia (360 kPa)	**GAS DENSITY AT 70°F. 1 atm** @ 77ºF (25ºC) = .164 lb/ft^3 (2.63 kg/m^3)
SOLUBILITY IN WATER Slightly Soluble	**FREEZING POINT** -244.8ºF (-153.8ºC)
EVAPORATION RATE N/A (Gas)	**SPECIFIC GRAVITY (AIR=1)** @ 77ºF (25ºC) = 2.22

APPEARANCE AND ODOR Colorless gas with a pleasant, sweet odor

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) -108ºF (CC)	**AUTO IGNITION TEMPERATURE** 882ºF (472ºC)	**FLAMMABLE LIMITS % BY VOLUME (See Page 4)** LEL 3.6 UEL 33
EXTINGUISHING MEDIA Water, dry chemical, carbon dioxide		**ELECTRICAL CLASSIFICATION** Class 1, Group Not Specified

SPECIAL FIRE FIGHTING PROCEDURES

Attempt to stop the flow of vinyl chloride. Use water spray to cool surrounding containers.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Vinyl chloride vapors are heavier than air and may travel a considerable distance to a source of ignition. Should fire be extinguished and flow of gas continue, increase ventilation to prevent formation of flammable mixtures in low areas or pockets.

REACTIVITY DATA

STABILITY		**CONDITIONS TO AVOID**
Unstable		None
Stable	X	

INCOMPATIBILITY (Materials to avoid) Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS None

HAZARDOUS POLYMERIZATION		**CONDITIONS TO AVOID**
May Occur	X	It is inhibited with phenol or hydroquinone to prevent polymerization.
Will Not Occur		

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD

Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION Hood with forced ventilation	**LOCAL EXHAUST** To prevent accumulation above the TWA	**SPECIAL** N/A
	MECHANICAL (Gen.) In accordance with electrical codes	**OTHER** N/A
PROTECTIVE GLOVES Most materials except natural rubber		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash “fountain,” transparent face shield		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Vinyl chloride, inhibited
DOT Shipping Label: Flammable Gas
I.D. No.: UN 1086; RQ 1.0(0.454)
DOT Hazard Class: Division 2.1

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connectinn cylinder to lower pressure (<150 psiq) pipinq or systems. Do not heat cylinder by any means to increase tne discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association’s Pamphlets I P-1 and P-10.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of noncombustible construction away from heavily trafficked areas and emergency exits.

Do not allow the temperature where cylinders are stored to exceed 125F (52C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a “first in - first out” inventory system to prevent full cylinders beins stored for excessive periods of time. Post “No Smoking or Open Flames” signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations, consult Compressed Gas Association’s Pamphlet P-1 and P-10.

SPECIAL PACKAGING RECOMMENDATIONS

Most metals except copper and its alloys may be used with vinyl chloride. Copper and its alloys could form explosive acetylides by reacting with the acetylene impurity in the product.

Teflon® is the preferred gasketing material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Earth-ground and bond all lines and equipment associated with the vinyl chloride system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of federal Law (49CFR).

(Continued on Page 4)

*Various Government Agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

HEALTH HAZARD DATA

TWA DATA: (continued)

(<5 Molar PPM averaged over any period not exceeding 15 minutes) with the prohibition of any personal direct contact with vinyl chloride liquid and it is classified as a cancer suspect agent.

RECOMMENDED FIRST AID TREATMENT: (Continued)

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO VINYL CHLORIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids with fingers to assure complete flushing. Continue for minium of 15 minutes. An eye specialict should be summoned promptly.

Skin Contact: Flush affected areas with copious quantities of water. Remove affected clothing as rapidly as possible. A physician should see the patient. Follow the water flush with a soap and water wash.

SPECIAL PRECAUTIONS

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued)

Always secure cylinders in an upright position before transporting them. Never transport cylinders in trunks OT vehicles, enclosed vans, truck cabs or in passenger compartments. Transport cyclinders secured in open flatbed or in open pick-up type vehicles.

Vinyl chloride is a toxic chemical and it is subject to the reporting requirements of SARA, Title III, Section 313.

ATTACHMENT D
COMMUNITY AIR MONITORING PLAN

SITE CHARACTERIZATION
JUNG SUN LAUNDRY PLUME
Site Number: 241102

Work Assignment No.
D004436-11

Prepared for:

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
625 Broadway
Albany, New York 12233

December 2007

Prepared by:

Earth Tech Northeast, Inc.
300 Broadacres Drive
Bloomfield, NJ 07003-3153

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Chapter **Page**

1.0 INTRODUCTION

A Community Air Monitoring Plan (CAMP) is used to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities.

A CAMP requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

2.0 MONITORING

No significant airborne concentration of contaminants is expected at the site. Real-time air monitoring for volatile organic compounds (VOCs) in the work area will be limited to periodic instantaneous measurements.

2.1 PERIODIC MONITORING

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location.

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) periodically. Upwind concentrations will be measured at the start of each workday to establish background conditions. The monitoring work will be performed using a photo-ionization detector (PID).

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for a 15-minute average calculated based on instantaneous measurements, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure,

whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average (calculated based on instantaneous measurements).

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.
- Instantaneous readings used for decision purposes will be recorded.