FINAL
WORK PLAN

INTERIM REMOVAL ACTION AND FOCUSED FEASIBILITY STUDY, SITES 3 AND 6

New York Air National Guard
Schenectady Air National Guard Base
Scotia, New York

Prepared for:

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LIST OF ABBREVIATIONS AND ACRONYMS

ABS	Absorption Factor
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ANG	Air National Guard
APA	Aircraft Parking Apron
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of Concern
CoC	Chain-of-Custody
CSM	Conceptual Site Model
CVOC	Chlorinated Volatile Organic Carbon
DCA	Dichloroethane
DCE	Dichloroethene
DNREC	Department of Natural Resources and Environmental Conservation
DO	Dissolved Oxygen
DoD	Department of Defense
DQO	Data Quality Objective
ECLR	Excess Lifetime Cancer Risks
EOS	Edible Oil Substrate
ERPIMS	Environmental Resources Program Information Management System
°F	degrees Fahrenheit
FID	Flame Ionization Detector
FS	Feasibility Study
FFS	Focused Feasibility Study
FSP	Field Sampling Plan
GPL	Groundwater Protection Limit
GRASP	Guaranteed Remediation and Accelerated Solutions Program
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

HSA	Hollow Stem Auger
HSCA	Hazardous Substances Control Act
ID	Inner Diameter
IRA	Interim Remedial Action
IRP	Installation Restoration Program
LNAPL	Light Non-aqueous Phase Liquid
LOAEL	Lowest-Observed-Adverse-Effect-Level
MCL	Maximum Contaminant Level
MDC	Maximum Detected Concentration
MDL	Method Detection Limit
ug/L	Micrograms per Liter
MFs	Modifying Factors
MNA	Monitored Natural Attenuation
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NCCA	New Castle County Airport
NCP	National Contingency Plan
NDD	Northwest Drainage Ditch
NOAEL	No-Observed-Adverse-Effect-Level
OD	Outer Diameter
OU	Operable Unit
PA	Preliminary Assessment
PAH	Polyaromatic Hydrocarbon
PC	Permeability Constant
PCE	Tetrachloroethene
PEF	Particulate Emissions Factor
PID	Photoionization Detector
POL	Petroleum, Oil, Lubricant
ppm	parts per million
PPRTVs	Provisional Peer Reviewed Toxicity Values
PQLs	Practical Quantitation Limits
PRE	Preliminary Risk Evaluation
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk Based Concentration
RfC	Reference Concentration
RfDs	Reference Doses

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
RPFs	Relative Potency Factors
SDI	Subchronic Daily Intake
SDWA	Safe Drinking Water Act
SF	Slope Factor
SI	Site Investigation
SQL	Sample Quantitation Limit
SSALs	Site Specific Action Levels
SVOC	Semi-volatile Organic Compound
SW	Solid Waste
TCA	Trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
THQ	Target Hazard Quotient
TPH	Total Petroleum Hydrocarbons
TPH-DRO	Total Petroleum Hydrocarbons-Diesel Range
TPH-GRO	Total Petroleum Hydrocarbons-Gasoline Range
UCL	Upper Confidence Limit
UFs	Uncertainty Factors
URSs	Uniform Risk-based Remediation Standards
US	United States
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOA	Volatile Organic Analysis
VF	Volatilization Factor
VOC	Volatile Organic Compound
WPCP	Water Pollution Control Plant

1.0 INTRODUCTION

Earth Tech has been issued Task Order Number 0062, under National Guard Bureau Contract Number DAHA92-02-D-0012 to perform interim remedial actions (IRAs) and a focused feasibility study (FFS) at the 109th Airlift Wing, Schenectady Air National Guard Base (SANGB) in Scotia, New York. The IRAs and FFS will be performed in general accordance with federal guidelines of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments Reauthorization Act (SARA). This Work Plan includes, as appendices, the Health and Safety Plan (HASP), Field Sampling Plan (FSP), and Quality Assurance Project Plan (QAPP).

The Department of Defense (DoD) has initiated a remediation program for evaluating suspected problems associated with historic waste disposal and spill sites at DoD facilities. As part of this program, the Air National Guard (NGB/A7CVR) has entered into an Interagency Agreement (IAG) with the U.S. Army, the U.S. Air Force, and the U.S. Environmental Protection Agency (EPA) to oversee the implementation of the Environmental Restoration Program (ERP) for the New York Air National Guard (NYANG). Under this agreement, the ANG/CERV manages the ERP and related activities.

Evaluation and investigation of historical Base operations at SANGB identified six Areas of Concern (AOCs). Subsequent evaluation and remedial actions performed under the Installation Restoration Program (IRP) resulted in a determination from the New York State Department of Environmental Conservation (NYSDEC) that No Further Action (NFA) was warranted for AOC Sites 1, 2, 4, and 5. Additional actions are required to secure an NFA for Site 3 and Site 6, shown in Figures 1-1 and 1-2, and complete the goals and objectives of the ERP based on the residual soil impacts at Site 3 and residual groundwater impacts at Site 6 in excess of Site Specific Action Levels (SSALs – see section 3 for definition)

The activities covered in the Work Plan include the removal and off-site disposal of historically impacted soils at Site 3 and Site 6, a treatability study of a presumptive remedy for groundwater remediation at Site 6, and a focused feasibility study of the presumptive remedy for Site 6. The goal of the IRAs included in this phase of work is to secure a determination of NFA for all remaining residual soil impacts. The goal of the FSS is to complete the engineering evaluation required under the guidance to select the remedial action alternative to be used for the residual groundwater impacts and secure a Record of Decision for implementation of the selected remedy and successful completion of the IRP.

1.1 BASE INSTALLATION RESTORATION PROGRAM BACKGROUND

This section summarizes previous investigations and remedial actions performed at SANGB. These investigations included a Preliminary Assessment (PA), Site Investigation (SI), Remedial Investigation (RI), a Supplemental Data Collection (SDC) program, and a Feasibility Study (FS) for Site 6. A Time Critical Removal Action (TCRA) was conducted at Site 6.

1.1.1 Preliminary Assessment

A PA was performed in 1988 by the United States Air Force, Hazardous Material Technology Center (HMTC). The PA included site visits, a review of existing environmental information, analysis of the Base records concerning the use, generation, and disposal practices of hazardous materials/wastes, and interviews with current and former Base personnel. The PA identified two AOCs subsequently designated Site 1: Former Fire Training Area; and Site 2: Former Drum Storage Area.

In April 1990, a construction crew performing routine repairs to a gravel road located adjacent to and east of the Base sewage treatment plant unearthed four metal drums. These drums and a small quantity of soil were removed for off-site disposal and the area restored to its original grade. Due to the potential for additional buried wastes in this area, the area was added as an AOC and designated Site 3.

1.1.2 Site Investigation

An SI including Sites 1, 2, and 3 was completed at the Base in 1996 by ABB Environmental Services. The SI included geophysical surveys, installation of groundwater monitoring wells, collection and analysis of surface soil and sediment samples, collection and analysis of surface water and groundwater samples, and aquifer testing. In the SI report, delisting of Sites 1 and 2 were recommended along with further investigation of Site 3. The NYSDEC concurred with the recommendations for Sites 1 and 3, but required further investigation of Site 2.

1.1.3 Remedial Investigation

In June 1999, an RI was completed at the Base (ANEPTEK, 2000). The RI initially included installation of groundwater monitoring wells, aquifer testing, and two rounds of groundwater sampling for Sites 2, and 3. The investigation at Site 3 also included the collection of soil and sediment samples, groundwater samples, and the excavation of 49 test pits to identify the types and extent of buried debris/wastes. All samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), herbicides, cyanide, propylene glycol, and metals. The investigation locations for Site 3 are illustrated in Figure 1-3.

During the RI, chlorinated compounds were detected in groundwater samples collected from monitoring wells upgradient of Site 3. Subsequent investigations reported a distinct chlorinated volatile organic carbon (CVOC) groundwater plume that was not apparently related to historical activity at Site 3. This area became designated as Site 6.

The investigation of Site 6 consisted of the installation of both permanent and temporary groundwater monitoring wells with two groundwater sampling events and the collection of 15 subsurface soil samples. A plume of dissolved phase CVOCs was delineated in the overburden water table aquifer and three “hot spot” areas (Areas A, B, and C) were identified with residual soil contamination in excess of the Site Specific Action Levels (SSALs).

The results of the RI concluded that NFA was appropriate for Site 2 and that Sites 3 and 6 should be further investigated. NYSDEC agreed with these conclusions and Site 2 was closed.

1.1.4 Time Critical Removal Action

In April of 2002, a TCRA consisting of the excavation and off-site disposal of approximately 173 cubic yards of soil from the three “hotspots” in Site 6 was performed. Post-excavation soil sampling results reported no residual impacts in two areas, Area B and Area C, in excess of SSALs. Two post-excavation sidewall samples collected from Area A reportedly contained tetrachloroethene (PCE) at concentrations in excess of the SSALs.

1.1.5 Supplemental Data Collection

A SDC sampling program for Site 6 was conducted at the Base in 2002. The SDC consisted of the installation of temporary and permanent monitoring wells for groundwater sampling and the collection of subsurface soil samples. Results from the SDC indicated that residual soil contamination (CVOCs) above SSALs was present in two areas in close proximity to the areas excavated during the TCRA. The groundwater results indicated that a dissolved-phase CVOC groundwater plume existed at Site 6. The SDC recommended further remedial measures be preformed for Site 6 soils and groundwater. The areas of concern for Site 6 are illustrated in Figure 1-4.

1.1.6 Feasibility Study

Following the completion of the SDC sampling program, a FS was developed for Site 6. The FS recommended excavation, treatment, and off-site disposal for soils and enhanced bioremediation for the groundwater.

1.1.7 Sediment Sample Results

Prior to submission of this WP, sediment samples were collected along the reach of the drainage ditch to determine if the exceedences of polyaromatic hydrocarbons (PAHs) in the three sediment samples collected from the ditch (1999 RI) were a result of contamination associated with Sites 3 and 6 or if they were due to upgradient sources (e.g., runoff over asphalted areas, fueling operations) unrelated to Sites 3 and 6. On November 7, 2006, a total of five sediment samples were collected from the drainage ditch (SED-1 through SED-5) as shown on Figure 1-5:

- SED-1 collected adjacent to Site 6 at the storm sewer discharge pipe that drains the lower portion of the SANGB; only small sediment deposits observed
- SED-2 collected from the culvert outlet under Taxiway G; only small sediment deposits observed
- SED-3 collected where storm sewer discharge pipe that drains the upper portion of the SANGB (including the bulk fueling area); significant amount of sediment deposits observed
- SED-4 collected from the culvert outlet under Taxiway F; significant amount of sediment deposits observed
- SED-5 collected approximately 140-ft upstream of weir where sediment deposition was first encountered and adjacent to Site 3

The five sediment samples were analyzed for SVOCs with the results are shown in Table 1-1. With the exception of SED-2 (which had the least amount of sediment available for collection), all the samples had detected levels of PAHs, but only two exceeded the SSALs. The most upstream sample (SED-4) had low levels of exceedences of PAHs and since this location receives off-base runoff, the source of these PAHs is not from Base activities. The sediment sample with the highest PAH levels (SED-5) were encountered in the sediment at the weir. The detected compounds in SED-5 are similar to those at SED-4 however their respective concentrations are at least an order of magnitude higher. The source of the contamination is likely due to an upstream source (e.g. runoff over asphalt areas, fueling operations) transported in the sediment runoff down the drainage ditch and deposited at the weir. Minor amounts of contaminated sediment runoff may be contributed from the Site 3 area. Since the quantity of contamination contributed would be difficult, if not impossible, to determine from individual sources both on-base and off-base, the sediment from the drainage ditch adjacent to Site 3 will be removed in conjunction with the other removal actions at Sites 3 and 6 so if any recontamination of the drainage ditch occurs in the future, Sites 3 and 6 will no longer be a source.

Table 1-1 Sediment Sample Results (November 2006)

Compound	SSALs (ug/kg)	Sediment Sample (ug/kg)				
		SED-1	SED-2	SED-3	SED-4	SED-5
Acenaphthene	50,000	ND	ND	ND	ND	ND
Acenaphthylene	41,000	ND	ND	ND	**120 J**	**1600 J**
Anthracene	50,000	ND	ND	ND	ND	**1900 J**
Benzo (a) anthracene	224	ND	ND	ND	**160 J**	**7300**
Benzo (a) pyrene	61	ND	ND	ND	**210 J**	**5500**
Benzo (b) fluoranthene	110	ND	ND	**48 J**	**270 J**	**8000**
Benzo (g,h,i) perylene	50,000	ND	ND	ND	ND	ND
Benzo (k) fluoranthene	110	ND	ND	ND	ND	**3400 J**
Chrysene	400	ND	ND	ND	**170 J**	**7500**
Dibenzo (a,h) anthracene	14	ND	ND	ND	ND	ND
Fluoranthene	50,000	**1800 J**	ND	**140 J**	**250 J**	ND
Fluorene	50,000	ND	ND	ND	ND	ND
Indeno (1,2,3-cd) pyrene	3,200	ND	ND	ND	ND	ND
Naphthalene	13,000	ND	ND	ND	ND	ND
Phenanthrene	50,000	ND	ND	**81 J**	ND	**9600**
Pyrene	50,000	ND	ND	**120 J**	**280 J**	ND

Samples analyzed by EPA Method 8270
NYSDEC Cleanup Criteria based on TAGM 4046 Recommended Soil Cleanup Objectives (Dec. 20, 2000)
Bold = analyte above detection limit / Shaded = concentration above NYSDEC Cleanup Criteria
ND = Not Detected
J = estimated

1.2 OBJECTIVES OF THE WORK PLAN

The overall project objectives for this WP include the following:

- To conduct IRAs at Sites 3 and 6 to remove and dispose off site any contaminated soil/sediment above SSALs and buried waste; and
- To develop a focused feasibility study (FFS) to vertically delineate groundwater contamination, perform an enhanced bioremediation pilot study, assess human health and ecological risks, and evaluate remedial alternatives for any residual contamination at Sites 3 and 6.

Site-specific objectives of this WP include the following:

- As an IRA at Site 3, remove contaminated media from two Test Pit (TP) areas (TP-1 and TP-7), one soil sample area (SS-5) identified during the RI, and the sediment from the drainage ditch;
- Investigate and remove the two geophysical anomalies from Site 3, discovered during the 2004 geophysical survey, and any associated contaminated soils;
- As an IRA at Site 6, excavate all unsaturated soils above the CVOC groundwater plume and dispose off site any stockpiled soils that have sampling results exceeding SSALs;
- Investigate and remove the two geophysical anomalies from Site 6 and any associated contaminated soils;
- Perform a pilot study to evaluate enhanced biodegradation of the CVOCs;
- Characterize the extent of contamination in the overburden and bedrock groundwater;
- Evaluate human health and ecological risks to establish groundwater cleanup goals;
- Develop a FFS to provide a detailed evaluation of groundwater remedial alternatives for Site 6.

1.3 SCOPE OF THE WORK PLAN

The following tasks outline the general scope of work:

- Site 3: excavate and dispose off site any contaminated soils and buried wastes from the two Test Pit areas (TP-1 and TP-7), one soil sample area (SS-5), and two geophysical anomalies;
- Site 3: sediment within the drainage ditch will be excavated and disposed off-site;
- Site 6: excavate all unsaturated soils above the CVOC groundwater plume, stockpile and segregate based on field screening, collect confirmation samples from stockpiled soils with PID readings above 5 part per million (ppm), dispose off site any soils with concentrations above SSALs, and use the remaining soil as backfill;
- Site 6: excavate and dispose off site any contaminated soils and buried wastes from the two geophysical anomalies;
- Site 6: while the excavation area above the CVOC groundwater plume is still open, mix an Edible Oil Substrate (EOS) into the groundwater and then install a series of up to four horizontal wells perpendicular to groundwater flow;
- Site 6: install and develop seven 2-inch inner diameter (ID) monitoring wells in the overburden groundwater;
- Site 6: install and develop one 4-inch ID monitoring well to a maximum of 25 feet below the ground surface (bgs) to monitor the bedrock groundwater;
- Site 6: collect three rounds of groundwater samples from eight new and five existing monitoring wells and analyze for VOCs and natural attenuation parameters; and
- Collect water level measurements in new and existing monitoring wells for development of a potentiometric surface map.

1.4 WORK PLAN ORGANIZATION

This IRA/FFS work plan is organized in the following sections:

- **Section 1.0 Introduction.** This section summarizes the purpose and scope of the work plan.
- **Section 2.0 Project Management Approach.** This section outlines project management organization.
- **Section 3.0 Soil and Groundwater Action Limits.** This section presents ANG established screening criteria.
- **Section 4.0 Installation Background and Environmental Setting.** This section includes discussion of the environmental setting at the Base on a regional and site-specific basis.
- **Section 5.0 Site Characterization and Investigative Approach.** This section identifies the current conditions and proposed activities of the areas of investigation at the Base.
- **Section 6.0 Human Health Risk Assessment (HHRA).** This section evaluates risk to human health and provides an ecological screening assessment.
- **Section 7.0 Focused Feasibility Study.** This section identifies possible remedial action alternatives that may be further developed and evaluated during the FS.
- **Section 8.0 Data Assessment, Records, and Reporting Requirements.**
- **Section 9.0 Project Schedule.**
- **Section 10.0 References.**

In addition to the work plan, the following documents are attached. These planning documents supplement information summarized in the work plan and comply with United States Environmental Protection Agency (USEPA) Superfund guidance for planning site investigations and cleanup.

- **Field Sampling Plan (FSP) – Appendix A**
- **Quality Assurance Project Plan (QAPP) – Appendix B**
- **Health and Safety Plan (HASP) – Appendix C**

2.0 PROJECT MANAGEMENT APPROACH

The purpose of the Project Management Approach is to identify the project management organization, assign project procedures for the various project functions, establish clear quality management procedures, and subcontract management.

2.1 PROJECT MANAGEMENT ORGANIZATION

The organizational structure of project management and communication between team members involved in this project are as follows:

- The ANG Project Manager: Samuel Pierre is a representative of the ANG and is responsible for managing and directing the work and communicating with other agencies.
- The Base Environmental Manager: Lt Col Ronald Leadley is the Environmental Management representative on Base and will be responsible for coordinating the project activities on Base.
- Earth Tech is the prime contractor in charge of the project implementation in accordance with the scope of work and this work plan, and selection and supervision of subcontractors.

2.1.1 Regulatory Agencies

The NYSDEC is the regulatory agency that has jurisdiction related to the project activities. The work plan, project schedule, and all results and submittals will be presented to NYSDEC for review. Work conducted under this project shall adhere to all applicable federal, state, and local regulations including all Base rules, regulations, protocols, chain of command, and requirements.

2.2 PROJECT PROCEDURES

The intent of this work plan is to provide all the planning information necessary to remove all unsaturated contaminated soils above SSALs in Sites 3 and 6 as IRAs, install additional groundwater monitoring wells to delineate the CVOC groundwater plume at Site 6, perform a pilot study to evaluate the use of enhance bioremediation as an remedial alternative for contaminated groundwater at Site 6, and develop a FFS that combines existing information with additional data collected in this document to evaluate long-term remedial alternatives at Site 6. The submittal of an IRA report and a FFS is designed to fulfill the objectives presented in this Work Plan.

2.3 QUALITY MANAGEMENT

Quality Assurance/Quality Control (QA/QC) will be performed for all tasks conducted during the period of performance of this project. NYSDEC and the ANG will review and give comments on all draft submittals and deliverables. Earth Tech will submit a response to comments and incorporate all comments before submitting final versions. Earth Tech will oversee all field activities associated with this work plan. A portion of samples submitted to the lab will have laboratory QA/QC performed, including duplicates and matrix spike/matrix spike duplicates (MS/MSDs).

2.4 SUBCONTRACT MANAGEMENT

Subcontractors have been selected by Earth Tech to perform specified tasks under this project. Supervision, inspection, and approval of all subcontractors' work will be the responsibility of Earth Tech. The following are the major subcontractors involved with this project along with their responsibilities.

- **Parratt-Wolff, Inc. –** Perform drilling, construction, and development of all overburden and bedrock monitoring wells. They will provide all equipment, materials, and permits required to complete the tasks laid out for them in the scope of work.
- **Chem Tech –** Provide all the analytical laboratory services for chemical evaluation all of soil, groundwater, and waste characterization samples collected during the project.
- **Microbial Insights, Inc. –** Provide the analytical laboratory services for all biological samples collected during the project.
- **Cedar Hill –** Supply all the hauling needs to transport contaminated soil from the site and clean backfill to the site; they will also supply all required backfill.
- **Colonie Landfill –** Is capable of accepting all non-hazardous contaminated soil removed from the site; however, based on the market conditions at the time of the fieldwork, another disposal facility may be used.
- **MJ Engineering –** Contracted to survey and provide survey data for all monitoring wells, confirmatory sample locations, or any other intrusive activity performed under this scope of work.

3.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This section presents information used to establish media-specific applicable or relevant and appropriate requirements (ARARs) criteria for chemicals released from Sites 3 and 6 that may have adverse impacts to human health, the environment, or water quality. Applicable requirements are cleanup standards, standards of control, or other substantive environmental protection requirements, criteria or limitation promulgated under Federal or State law which specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site. Relevant and appropriate requirements are those Federal and/or State requirements that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, address problems or situation sufficiently similar to those encountered at a CERLCA site that their use is well suited to the particular site.

The determination of ARARs for the IRA/FFS is based on a review of: (1) the types, quantities and extent of contaminants present at the site, (2) local considerations of the site, and (3) the types of actions used at the site to mitigate the public health and environmental threats posed by the release of contaminants at the site. The potential chemical-specific ARARs are presented in Table 3-1.

From the chemical-specific ARARs, action-specific Site Specific Action Levels (SSALs) are selected. The SSALs guiding the efforts in this Work Plan are taken from NYSDEC guidance documents and are media specific:

> GROUNDWATER: Ambient Water Quality Standards (AWQSs) from NYSDEC's *Technical and Operational Guidance Series* (TOGS) 1.1.1 – *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (1998).
>
> SOIL: Recommended Soil Clean-up Objectives (RSCOs) from NYSDEC's *Technical and Administrative Guidance Memorandum* (TAGM) 4046 – *Determination of Soil Cleanup Objectives and Cleanup Levels* (1994).

No IRAs are included with this Work Plan to mitigate groundwater. However, in order to evaluate the efficacy of enhanced bioremediation and the results of the field-scale pilot study, TOGS criteria for the chlorinated compounds – tetrachloroethene (PCE), trichloroethene (TCE) and their breakdown products dichloroethene (DCE) and vinyl chloride (VC) – will be used. The TOGS 1.1.1 criteria for these compounds are listed in Table 3-2. For compounds with multiple standards or guidance values based on usage, most restrictive criteria is assumed.

Based on the results of the RI and SDC, the chemicals of concern (COCs) for Sites 3 and 6 soils are VOCs, SVOCs and metals. The SSALs for these COCs, as provided in TAGM 4046, are presented in Table 3-2.

Table 3-1 Potential Chemical-Specific ARARs for Sites 3 and 6

ARARs	SYNOPSIS
Federal ARARS	
Clean Water Act (CWA) Ambient Water Quality Criteria (AWQC); CWA Section 304	Federal AWQC are health-based criteria that have been developed for 95 carcinogenic and non-carcinogenic compounds. AWQC for the protection of human health provides levels for exposure both from drinking the water and consumption of aquatic organisms (i.e., fish) and from the consumption of fish alone. AWQC for the protection of aquatic life includes acute and chronic levels for freshwater and marine organisms. Remedial actions involving contaminated surface water or groundwater must consider water uses and the circumstances of the release or threatened release.
Safe Drinking Water Act (SDWA) National Drinking Water Regulation (40 CFR 141)	Local wells use groundwater for drinking water supplies; therefore, the SDWA maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) are potential ARARs for the aquifer. MCLs are legally enforceable federal drinking water standards and MCLGs are nonenforceable health goals established by the USEPA.
State ARARs	
New York State Rules for Inactive Hazardous Waste Sites 6 New York Code of Rules and Regulations (NYCRR) Subpart 375	This regulation includes the New York State regulations for inactive hazardous waste sites.
New York State Water Quality Regulations 6 NYCRR Chapter X	This regulation establishes the requirements for the State Pollutant Discharge Elimination System (SPDES) program. This program provides the standards for surface water and drinking water to protect human health and the environment. Parts 701 and 702 includes surface water standards and Part 703 includes groundwater standards.
New York State hazardous Waste Regulations 6 NYCRR Part 373	This regulation includes the standards from groundwater monitoring for releases from solid waste management units.
New York State Drinking Water Regulations 10 NYCRR Part 5; NYSDEC TOGS 1.1.1	This regulation provides the NYSDOH drinking water quality standards. These regulations would apply to groundwaters used for drinking water supplies. Specific standards and guideline values are included in the guidance document TOGS 1.1.1.
NYSDEC TAGM HWR-94-4046	This guidance document provides cleanup standards for soil in New York State. These criteria are not promulgated standards but may be used to establish site-specific action levels.

Table 3-2 Site Specific Action Levels for Sites 3 and 6

COCs	AWQS TOGS 1.1.1 (µg/l)	Ref	RSCOs TAGM 4046 *** (mg/kg)	Ref
VOCs				
4-Isopropyltoluene	5	b	NS	
cis-1,2-Dichloroethene	5	b	43.5 0.40	c d
Tetrachloroethene	5	b	1.4	a
Trichloroethene	5	b	0.7	a
Toluene	5	b	1.5	a
trans-1,2-Dichloroethene	5	b	0.3	a
Vinyl chloride	2	b	0.2	a
SVOCs				
2-Methylnapthalene	NS		36.4	a
2-Methyphenol	1800	c	0.100 or MDL	a
Acenaphthene	370	c	50.0**	a
Acenaphthylene	NS		41	a
Anthracene	1800	c	50.0**	a
Benzo(a)anthracene	0.092	c	0.224 or MDL	a
Benzo(b)fluoranthene	0.092	c	1.1	a
Benzo(k)fluoranthene	0.92	c	1.1	a
Benzo(g,h,i)perylene	NS		50.0**	a
Benzo(a)pyrene	0.0092	c	0.061 or MDL	a
Bis(2-ethyhexyl)phthalate	5	b	50.0**	a
Chrysene	9.2	c	0.4	a
Dibenz(a,h)anthracene	0.0092	c	0.014 or MDL	a
Dibenzofuran	12	c	6.2	a
Diethyl phthalate	29000	c	7.1	a
Di-n-butyl Phthalate	50	b	8.1	a
Fluoranthene	1500	c	50.0**	a
Fluorene	240	c	50.0**	a
Indeno(1,2,3-cd)pyrene	0.092	c	3.2	a
Naphthalene	6.2	c	13	a
Phenanthrene	NS		50.0**	a
Phenol	1	b	0.03 or MDL	a
Pyrene	180	c	50.0**	a

Table 3-2 (continued)
Site Specific Action Levels for Sites 3 and 6

COCs	AWQS TOGS 1.1.1 (µg/l)	Ref	RSCOs TAGM 4046 *** (mg/kg)	Ref
Total Inorganics				
Aluminum	36000	c	SB	a
Antimony	3	b	SB	a
Arsenic	25	b	7.5 or SB	a
Barium	1000	b	300 or SB	a
Beryllium	73	c	0.16 or SB	a
Cadmium	5	b	1 or SB	a
Chromium	50	b	10 or SB	a
Cobalt	730	c	30 or SB	a
Copper	200	b	25 or SB	a
Iron	300	b	2000 or SB	a
Lead	25	b	SB*	a
Manganese	300	b	SB	a
Mercury	0.7	b	0.1	a
Nickel	100	b	13 or SB	a
Selenium	10	b	2 or SB	a
Silver	50	b	SB	a
Thallium	2.4	c	SB	a
Vanadium	36	c	150 or SB	a
Zinc	11000	c	20 or SB	a

Notes:
SB – Site Background
MDL – Method Detection Limit
NS – None specified
* - Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4-61 ppm and in metropolitan or suburban areas or near highways typically range from 200-500 ppm (NYSDEC).
**As per TAGM #4046, Total VOCs<10ppm, Total semi-VOCs<500ppm and individual semi-VOCs<50ppm.
*** Values based on a TOC of 1%. TOC data for subsurface soils ranged from 6,700 (0.67%) to 23,000 mg/kg (2.3%) with a background level of 15,000 mg/kg (1.5%) (RI report, table 6-16).

References:
a - NYSDEC. 1994. Determination of Soil Cleanup Objectives and Cleanup Levels – Technical and Administrative Guidance Memorandum #4046. Division of Environmental Remediation. New York.
b - NYSDEC. 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Division of Water Technical and Operational Guidance Series (1.1.1). New York.

4.0 INSTALLATION BACKGROUND

The following sections discuss the environmental setting at the Schenectady ANGB on a regional and site-specific basis.

4.1 FACILITY DESCRIPTION AND HISTORY

The Schenectady ANGB is located in the southeast portion of Schenectady County Airport (SCA) in Scotia, New York. The Base covers an area of approximately 106 acres. The airport is located approximately 2 miles northeast of Scotia, NY. The location of the Base is illustrated in Figure 1-1.

The land located to the north, east, and west of the Base is primarily residential and agricultural. South of the Base is the Mohawk River, a railway, and commercial and residential properties. Prior to the construction of the Base, the property was used for agricultural purposes.

In November 1949, the ANG authorized the formation of the 139th fighter squadron of the New York National Guard. This unit was previously located at the Scotia Naval Depot, which is approximately three miles west of the Base. By September 1950, the permanent facilities for the unit were completed at the SCA and consisted of the present administration building, hangar, vehicle maintenance, and various supply buildings.

Since 1950, the Base has operated an array of military aircraft under numerous assignments. These have included the B-6, C-47, the C-97A, and C-97G Stratocrusiers, various models of the C-130 Hercules, F-94 Starfire jets, P-47 Thunderbolt, P-51 Mustang, and the T-6. In 1991, the unit was redesignated to the 109th Airlift Wing and has since continued operations of the C-130H Aircraft.

4.2 CLIMATE, TOPOGRAPHY, AND SURFACE WATER

Climate

The average daily summertime high in Scotia is 79.3 degrees Fahrenheit (^{o}F). The average daily low in the winter is 16.0^{o}F. The hottest month is July with an average daily high temperature of 82^{o}F. The coldest month is January with an average daily low temperature of 13^{o}F. Precipitation averages 36.5 inches per year. June is the wettest month with an average of 3.70 inches of precipitation. February is the driest month with an average of 2.20 inches of precipitation.

Topography

The Schenectady ANGB lies in the Mohawk Valley section of the Hudson-Mohawk Lowlands in east-central New York (Figure 4-2). The Base is located north of the Mohawk River and has an elevation between 300 and 400 feet above mean sea level. The terrain occupied by the Base is generally flat but dipping slightly to the South and East toward the river. Near the southern boundary of the Base is a steep slope descending into the Mohawk River valley. A detailed discussion of regional and local geology can be found in Section 4.3.

Surface Water

Surface water on Base from developed areas is drained by a series of storm drainage systems and swales. Undeveloped areas are drained by topographically controlled sheet wash flow that discharges to the drainage swales.

All storm water eventually discharges to the south into an unnamed creek which eventually discharges into the Mohawk River. The majority of the Base is paved and graded to provide runoff to the storm drainage systems.

There are no permanent surface water bodies or streams located on the Base.

4.3 GEOLOGY

4.3.1 Regional Framework for Site Geologic Conditions

The surficial deposits of the region are predominantly glacial deposits that have been modified to varying degrees by post-glacial processes. The origin of these deposits is relevant to the nature and distribution of geologic materials at the site.

The Schenectady ANGB lies within the Mohawk River Valley Lowlands of the Hudson-Mohawk Lowlands Physiographic Province. A principal influence of the regional physiography was to divide the glaciers that covered the region into well-defined lobes. The site is located near the confluence of two such lobes, the Hudson Lobe and the Mohawk Lobe. The southward flowing Hudson Lobe overrode the Hudson Lowlands and adjacent uplands, while the westward flowing Mohawk Lobe overrode the Mohawk Lowlands west of the site (LaFleur, 1965, Dineen, 1986).

The sequential melting, retreating and occasionally readvancing of these glacial lobes controlled the development of a series of glacial lakes in the lowlands. During the early stages of deglaciation, the waning Mohawk Lobe retreated and left a series of ice-contact lakes while the Hudson Lobe persisted (LaFleur, 1965). Eventually the Mohawk Lobe was succeeded by glacial Lake Amsterdam in the Mohawk Valley. Drainage from Lake Amsterdam was blocked by the Hudson Lobe ice that persisted east of the site.

The Hudson Lobe gradually retreated northward, with the melting waters forming proglacial Lake Albany. As the margin of the Hudson Lobe melted back northward through the Albany-Schenectady area, Lake Albany widened at the 330-foot elevation level where the lowlands are wider. Once the Hudson Lobe had melted back north of the Mohawk Valley, glacial Lake Amsterdam was drained and the eastward Mohawk River drainage was established (Dunn, 1989). The Mohawk immediately began to build the extensive Schenectady delta into Lake Albany covering most of the area of the present Village of Scotia and City of Schenectady. The western part of the delta was dominated by coarse-grained outwash sand and gravel, whereas the distal portions, which include the site, were finer grained (Dunn, 1989).

As the Hudson Lobe continued to melt northward, new outlets for the meltwater opened up at lower elevations and the glacial lake levels progressively fell. Lake Albany declined from elevation 330 feet when the Schenectady delta was formed to 310 feet, then to 280 feet (Lake

Quaker Springs), and finally to 240 feet (Lake Coveville) (LaFleur, 1979). As lake levels lowered, Mohawk drainage occupied several distinct drainage channels as it carried both normal discharge and episodic high-energy drainage outbursts. During this sequence of lowering lake levels, episodic drainage outbursts, and changing channels, the delta deposits near the site were eroded, incised and reworked by Mohawk waters. When lake levels lowered sufficiently, deposition of the Schenectady delta ended, the broad delta became exposed, the local water table dropped, the sediments dried, the wind eroded the finer grained deltaic sediments, and eolian (windblown) deposits were spread across the valley.

Subsequent fluvial adjustments and reworking of surficial deposits have continued on a smaller scale during post-glacial time (Dunn, 1989). This has included covering much of the valley floor with a veneer of alluvial sand and silt deposited by the present Mohawk River. Silt deposition predominated in backwater or topographic depressions in the floodplain. A mapped lens of such lacustrine silt (Brown, 1982) overlying sand is present in the site area.

4.3.2 Regional and Local Geology

4.3.2.1 Surficial Geology

The unconsolidated deposits in eastern Schenectady County are not uniform in character; rather they consist of interbedded strata or lenses of different types of material. The majority of all unconsolidated deposits are glacial deposits. The unconsolidated deposits consist of glacial till which was directly deposited by the glaciers; clays, silts and sands which were deposited by temporary glacial lakes; and coarse sands and gravel deposited by fluvioglacial streams originated at the head of melting glaciers.

As the glaciers advanced over the area, the topography was modified; parallel ridges and valleys were formed by the movement of ice. Glacial till was deposited directly from the sheet of moving ice. Till is one of the most widespread Pleistocene deposits in the region. A surficial geology map of the site and surrounding areas in the Mohawk and Hudson Valleys can be seen in Figure 4-3.

The till in the Schenectady region contains igneous and metamorphic cobbles and boulders that originated in the Adirondack Mountains. The unweathered till underlying the Base is usually gray to dark gray, silty to sandy clay containing cobbles and boulders. Thin sands and/or gravel lenses are randomly scattered through the till. The thinnest deposits of till are present on the uplands surrounding the Base with thicker deposits found in bedrock depressions. During the retreat of the ice, Glacial Lake Albany was formed in the lowland regions confined by the upland boundaries of the Hudson Valley. Deposits from the lake included clays, silts and sands.

Some of these materials deposited into Lake Albany were carried via fluvioglacial streams. Due to the higher velocity in these streams, the resulting deposits mainly consisted of coarse sands and gravels. As the Mohawk Valley widened, velocity decreased, and as a result finer sediments materials were deposited. After Lake Albany eroded through the lower Hudson Valley barrier, the Mohawk River began scouring its way back upstream of the Schenectady area and erode its present downstream course.

4.3.2.2 Bedrock Geology

The bedrock units underlaying SANGB consist of the Schenectady Formation, which is comprised of alternating shale and sandstone. The formation was deposited during the upper Middle Ordovician Period, about 440 million years ago. During that time period, sea level was much higher than it is today and the sedimentary rocks were formed underwater. The sediment consisting of alternating layers of shale and sandstone was originally deposited in shallow Ordovician seas as clays, silts, and sand deposited in a basin, along lateral fans of a sub-marine fan, formed by a sinking foreland basin in front of the rising Green Mountains to the east (Ruedemann, 1930). These sediments were buried by younger sediments, consolidated, then raised above seas level and subjected to erosion and weathering. Folding and faulting of strata are present in the eastern and western parts of the County. The topography of the bedrock surface represents the scouring action of the moving ice during the Pleistocene glaciation.

Bedrock units underlying Schenectady County consist of the Schenectady Formation, Canajoharie Shale, and the Trenton and Black River Groups. Smaller portions of the Beekmantown Group are also found in the northwestern corner of the County (Figure 4-4).

The Schenectady Formation surrounds the Base and is Ordovician in age and is composed of layers of black to gray shale with coarse-grained sandstone lenses, greywackes, and siltstones. In some places the alternation of beds of shale and sandstone follow a coarsening upward pattern. The Schenectady Formation is estimated to have a thickness of 2,000 feet and a gentle south to southwest dip of up to 5 degrees. The Canajoharie Shale Unit, which directly underlies the Base is comprised of fine grained black shales and is estimated to be at least 1,000 feet thick in some areas of the Mohawk Valley.

The rocks of the Schenectady Formation are dense and relatively impermeable. The bedrock may yield small amounts of water from fractures and bedding planes but low yield and poor quality generally characterize the bedrock water-bearing zone. The direction of groundwater flow in the bedrock water-bearing zone is determined locally by fracture position and size, density of joints and bedding planes, and by the interconnection with the overburden water-bearing zone.

4.4 HYDROGEOLOGY

4.4.1 Regional Hydrogeology

The Schenectady ANGB is situated near the eastern peripheral end of the Schenectady Aquifer, a highly permeable, unconfined glacial drift aquifer occupying a 25-square-mile portion of the Mohawk River Valley. The part of the Aquifer that includes the site is finer grained, less productive, and less subject to recharge. It is not used for public water supply. Groundwater impacts at the site are not expected to affect public or any known drinking water supplies.

The Schenectady Aquifer, which is also referred to as the Great Flats Aquifer, the Schenectady Sole Source Aquifer, and by other names, is the sole source of potable water to five municipalities and approximately 90 percent of Schenectady County residents. Municipal well fields tapping this groundwater resource include the City of Schenectady, Town of Rotterdam (including a separate well field at Rotterdam Junction), Town of Glenville, Village of Scotia and part of the Town of Niskayuna. Pumping wells are approximately 50 feet deep.

Regionally, groundwater flow tends to follow topographic controls, and flows to the south and southeast towards the Mohawk River. Most of the water supplies are from groundwater sources, mainly from the highly permeable unconsolidated glacial deposits which overlie somewhat impermeable bedrock. Groundwater supplies are available in moderate to large quantities from the unconsolidated deposits in the Mohawk River valley and in small quantities from bedrock formations.

Groundwater recharge occurs almost wholly from precipitation. Under natural conditions, the water table fluctuates on a seasonal basis depending on recharge and discharge. Water table elevations rise in the spring and decline in the fall following a cyclic pattern. Both consolidated and unconsolidated units in Schenectady County are sources of water or are possible water supply sources. Both can be considered aquifers, even though their water-bearing characteristics vary greatly. The water-bearing properties of subsurface materials present within the area of the Base are described below.

Regional bedrock formations are relatively poor sources of groundwater and normally only yield enough water for domestic use. The rocks are relatively impermeable, and groundwater only occurs principally in openings along joints in the rock. The most common water-bearing zone lies within the top few feet of the bedrock surface.

The regional overburden consists of glacial deposits containing irregularly spaced lenses of sand and gravel deposited from fluvioglacial streams. These deposits are the most productive sources of water in the area. These lenses were incorporated into the till during deposition and can range greatly in aerial extent and thickness due to changing depositional conditions. At many locations, a thin permeable zone of gravel is present between the till and the underlying bedrock that is capable of producing thousands of gallons per minute in water production (ANEPTEK, 2000).

4.4.2 Local Hydrogeology

Overburden deposits at the Base consist predominately of clay and silt overlying fractured bedrock. Groundwater elevations reported in previously installed monitoring wells screened at the overburden/bedrock interface ranged between 6 and 11 feet bgs. Hydraulic conductivity tests conducted in these monitoring wells reported groundwater flow velocities estimated between 2 and 25 feet per year (ANEPTEK, 2002) consistent with a fractured bedrock (ANEPTEK, 2000) or a silt-clayey fine sand.

Competent bedrock has been encountered at approximately 20 feet below ground surface. As part of the site investigations, four deep bedrock borings (3 in the SI, and 1 in the RI) were advanced to a depth of 100 feet or deeper. Groundwater was not encountered and the borings were grouted and abandoned.

The Base obtains its water supply from the Town of Glenville, whose well field extracts groundwater from the Great Flats Aquifer. In addition, over twenty-five private wells are located within a one-mile radius of the Base. The private wells are used for a variety of purposes including commercial, public, stock, and domestic use (USGS, 2006). Overall depth range of the private wells range from 4 feet bgs to over 200 feet bgs. Lithologies reported in these wells consisted of sandy-gravel or shale.

Previous investigations indicate that local groundwater flow appears to be southerly to southeasterly towards the Mohawk River (ANEPTEK, 2000).

5.0 SITE CHARACTERIZATION

The following sections discuss the current conditions and specify and detail the proposed field activities to be completed for Site 3 and Site 6 at SANGB in Scotia, NY.

5.1 DESCRIPTION AND HISTORY OF INVESTIGATION/REMEDIATION SITES

Site 3

Site 3 is located near the southeast corner of the Base immediately south-southwest of the former sewage treatment facility. Based on delineation of impacts in Site 3, the area is demarcated as an oval area approximately 125 (SW-NE) by 200 feet (NW-SE). The area is open undeveloped field and/or brush covered. The ground surface dips to the southwest and west. It is bounded to the east by a gravel road and to the west by a storm water drainage channel. Site 3 is approximately delineated to the north and south based on the results of previous investigation activities.

During construction of a gravel road (along the east edge of Site 3) in 1990, metal drums were unearthed from this area and removed. Subsequent investigation activities performed in Site 3 determined the presence of additional buried metallic objects. Site specific action levels were exceeded in soil samples collected from two test pits, one soil boring, and three sediment samples collected from the drainage ditch along the west side of Site 3 (ANEPTEK, 2000). The contaminants of concern at Site 3 were primarily petroleum related.

A geophysical survey of Site 3 identified two anomalies requiring further investigation.

Site 6

Site 6 is located northwest of the former sewage treatment plant and upgradient, topographically and hydraulically, from Site 3. It is mostly an undeveloped open field measuring approximately 150 feet by 200 feet based on previous investigation results. A former sewerage discharge gallery/holding tank was located near the north boundary of Site 6.

Two investigations performed at Site 6 include an initial groundwater investigation in 1998/99 and a SDC in 2002. The results of the investigations indicated contamination of both soils and groundwater above SSALs. A TCRA removed 173 cubic yards of contaminated soil from three "hot spots" to prevent further residual soil contamination from leaching into the groundwater.

Post-excavation soil sampling indicated that two of the excavation areas (Area B and Area C) had been successfully mitigated. However, sample results for Area A reported residual contamination in excess of the SSALs in the north and south sidewalls samples, which will require further delineation and removal. The SDC indicated four areas of residual soil contamination remained in Site 6.

A groundwater contaminant plume identified during the RI was further characterized in the SDC and determined to be approximately 150 feet long north to south (between TW-17/TW-19 and 6MW-09) and 80 feet wide east to west (between 6MW-13 and TW-27). Concentrations of VOCs (PCE and TCE) varied from 5 parts per billion (ppb) to 3,700 ppb. No SVOC contamination was detected.

The contaminants of concern at Site 6 include chlorinated hydrocarbons (i.e., PCE, TCE, cis-1,2-dichloroethene [cis-1,2-DCE], and vinyl chloride [VC]) and petroleum hydrocarbons (i.e., xylene).

A geophysical survey of Site 6 identified two anomalies requiring further investigation.

The following table summarizes the current conditions/issues for Site 3 (as illustrated in Figure 5-1).

Table 5-1 Site 3 Summary

Site 3	Investigation Results
Test Pits	Two test pits contain contamination above SSALs: TP-1 VOC contamination (weathered gasoline), buried paint containers and debris TP-7 SVOC contamination (likely diesel or jet fuel) and debris
Soil	One soil sample (SS-5), collected adjacent to a vehicle access roadway, reported SVOC concentrations above SSALs. The elevated levels are likely due to vehicle emissions.
Groundwater	No contamination detected in groundwater downgradient from test pit locations above SSALs.
Sediment	Sediment samples collected from stormwater ditch contained SVOCs above SSALs.
Geophysical Survey	Two anomalies discovered in survey area: C: Western edge of fence (metallic object) D: East/central portion of road way (metallic object foundation)

The following table summarizes areas of concern at Site 6 (as illustrated in Figure 5-2).

Table 5-2 Site 6 Summary

Site 6	Investigation Results
Soil	Four isolated “hot spots”: SB-25/SB-26: PCE levels above 14,000 ppb. SB-5: PID reading of 200 ppm SB-6: PID reading of 300 ppm SB-19: TCE concentration of 2,800 ppb.
Groundwater	Groundwater plume roughly 150 feet long by 80 feet wide. Primary contaminants include PCE and TCE and their breakdown daughters cis-1,2-DCE and VC, indicating biodegradation is occurring. The highest concentration of PCE was reported at 6MW-13 at 3,700 ppb.
Geophysical Survey	Two anomalies discovered in survey area: A: Northwest corner (possible UST) B: Southwest corner

5.2 FIELD ACTIVITES

5.2.1 Mobilization and Site Preparation

All areas on Base where excavation, drilling or other intrusive activity may occur will be cleared for all utilities. Base personnel, Dig Safely New York and potentially affected private utility companies will be notified of Earth Tech’s work plans and identify their utilities. Base personnel will mark utilities at the point where SANGB assumes private ownership. If a dispute arises over the ownership of utilities in a certain area, or if the available information is insufficient to locate a utility within safety limits, a utility locater firm may be used to locate and mark that utility within that area.

A site preparation map indicating the work zones, staging/stockpile soil areas, equipment and material storage areas, container storage, decontamination stations, waste (IDW and trash) storage areas, fence relocation, temporary water treatment system and all other necessary construction zone features will be prepared by Earth Tech and submitted prior to mobilization.

5.2.2 Excavation and Disposal

To facilitate final closure for Site 3 and Site 6 and remove all potential sources of impacts to the groundwater, all residually impacted sediments and soils will be excavated and removed for off-site disposal as IRAs for those sites. All management and disposal of the excavated soil will be in accordance with the March 2005 *Policy on Air National Guard Investigation and Remediation Derived Waste (IDW/RDW) Management*. The following sections outline the methods and rationale to be used in each area to conduct and complete the IRAs. Details concerning the methods and procedures used to excavate soils and backfill the excavations are specified in the FSP.

5.2.2.1 Site 3 Soil Excavation

Soils will be excavated at the locations of the two former test pits (TP-1 and TP-7) and one surface soil sample (SS-5) where residually impacted soils remain. It is estimated that an area 15 foot square and five foot deep will be excavated at each former test pit location and an area 10 foot square and two foot deep will be excavated at the location of surface soil sample SS-5. Excavation in each area of Site 3 will continue until all evidence of residual impacts has been removed or the water table is encountered. The areas of excavation and assumed limits of excavation are illustrated in Figure 5-3.

Post-excavation soil samples will be collected from each of the sidewalls and the base of each of the excavation area to confirm the removal. Samples from each excavation will be submitted for those suites of analyses that were reported in previous investigations in excess of the SSAL's only [TP-1: VOCs only; TP-7 and SS5: SVOCs only]. Sample collection and analysis will be performed in accordance with the methods and procedures specified in the FSP.

If water table conditions are encountered in any excavation, a grab sample of the groundwater will be collected and submitted for laboratory analysis. Any grab groundwater samples collected will be analyzed for VOCs and SVOCs. Grab sample collection and analysis will be performed in accordance with the methods and procedures specified in the FSP.

Each of the two identified geophysical anomalies will be excavated and evaluated and any residually impacted soils removed for off-site disposal. Excavation of the anomalies will follow the same procedures described above. The locations of each of the excavation areas and assumed limits of each excavation are illustrated in Figure 5-1. A confirmation sample will be collected from the base of each anomaly and analyzed for VOCs, SVOCs, and metals. If the excavation exceeds 10-ft by 10-ft, then side was confirmation samples will be collected.

All excavation activities will be performed under the direct supervision of an on-site environmental geologist. A detailed descriptive log of each excavation will be recorded and included in the IRA Report. Soils will be excavated and screened in the field for any visual or olfactory evidence of contamination and headspace samples collected and screened with a photoionization detector.

To the extent practical, all excavated soils will be segregated based on visual, olfactory, or headspace screening evidence of contamination and temporarily staged on site. Staged soils will be placed in a pre-determined prepared holding area(s) lined with polyvinyl pending determination of disposal options. All stockpiled soils will be sampled for waste characterization profiles to determine applicable disposal and/or on-site reuse options. Waste characterization sampling will be performed in accordance with the methods and procedures specified in the FSP.

Based on post-removal sampling results, non-impacted staged soils will be used as backfill and impacted soils will be transported off site for disposal at an appropriately permitted facility.

5.2.2.2 Site 3 Sediment Excavation

As discussed in Section 1.1.7, the sediment in the drainage swale abutting the west edge of Site 3 containing levels of PAHs above SSALs will be removed. The removal action will be limited to the depositional segment of the ditch that extends approximately 150-feet upstream from the weir. No removal will occur prior to this point since the ditch bed is constructed will large, evenly spaced rocks to purposely prevent the accumulation of sediment.

Approximately 150 cubic yards of soil/sediment will be removed from the 150-foot length of the variable width drainage swale. The loose fine-grained soils will be excavated and directly loaded for transportation to an off-site disposal facility. One post-excavation soil sample will be collected from the base of the swale every 50 linear feet for confirmation of removal. Post-excavation sampling will be performed in accordance with the methods and procedures specified in the FSP.

The drainage swale flows continuously with larger flows occurring shortly after recent precipitation. The sediment excavation will be scheduled, as best possible, to occur during dry conditions. By-pass pumping, silt curtains and sediment traps will be installed to prevent the release during the removal action of any potentially impacted soil/sediment over the weir located at the downstream end of Site 3. It is assumed that the swale will be excavated from the upstream start point to the downstream end point in three 50-foot lengths. If needed, based on current conditions at the time of removal, one trap/curtain will be installed at the downstream end of each 50-foot length of the excavation.

5.2.2.3 Site 6 Soil Excavation

All Site 6 soils located above the CVOC groundwater plume bounded by the 50 ppb isopleth as delineated in previous investigations will be excavated (Figure 5-4). All of the soil in an area approximately 80 feet by 120 feet will be removed from the ground surface to 1 foot to 2 feet below the water table (estimated at approximately 5 to 7 feet bgs) or to the top of competent bedrock, whichever is encountered first.

All excavation activities will be performed under the direct supervision of an on-site environmental geologist. A detailed descriptive log and photographic log of the excavation will be recorded and included in the IRA Report. Soils will be excavated and screened in the field for any visual or olfactory evidence of contamination and headspace samples collected and screened with a PID. Excavated soils will segregate and staged based on observation of visual and/or or olfactory evidence of contamination and placed in prepared staging areas. One stockpile will be used for all soils exhibiting PID measurements less than 5 ppm. One stockpile will be used for soils that exhibit PID measurements ranging from 5 ppm to 50 ppm, and one stockpile will contain soils with PID measurements in excess of 50 ppm or viably stained.

Post-excavation confirmatory soil samples will be collected from the sidewalls of the excavation. One grab sidewall sample will be collected approximately one foot above the top of the water table (two feet above the base of the excavation) at an interval of approximately 25 linear feet (Figure 5-4). Since the excavation will be extended below the water table into the impacted groundwater, no post-excavation base samples will be collected, as these are assumed to be impacted. Sample collection and analysis will be performed in accordance with the methods and procedures specified in the FSP.

In the event that post-excavation sampling results indicate that one or more sidewall samples exhibit residual contamination in excess of SSALs, the limits of excavation will be extended at those locations and an additional round(s) of post-excavation samples collected for analysis. Excavation will continue until ALL post-excavation samples results reported contaminant concentrations less than the SSALs.

Waste characterization samples (one five point composite per 1,000 cubic yards) will be collected from the stockpiled soils that exhibited PID readings in excess of 5 ppm. All soils with PID readings greater than 50 ppm (or visibly stained) will be disposed off-site. Stockpiled soils with PID readings between 5 ppm and 50 ppm and with analytical results in excess of SSALs will be removed for off-site disposal at an appropriately permitted facility. All remaining staged soils will be used as backfill. Waste characterization sampling will be performed in accordance with the methods and procedures specified in the FSP.

5.2.3 Monitoring Well Installation

A total of eight new groundwater monitoring wells will be installed to supplement the existing monitoring well system: seven monitoring wells in the overburden aquifer and one monitoring well in the underlying bedrock aquifer (maximum of 25 feet deep). Additional monitoring wells may be installed to replace any existing on-site monitoring wells that may need to be destroyed during excavation activities (none are anticipated at this time).

Out of the seven overburden monitoring wells installed one will be upgradient of Site 6, five will be within the footprint of the Site 6 excavation (inside the 50 ppb total CVOC isopleth) and two will be immediately downgradient of the assumed leading edge of the dissolved CVOC plume as delineated by previous investigations. The proposed locations of these new monitoring wells are included in Figure 5-5.

Overburden monitoring wells will be installed using conventional hollow-stem auger drilling techniques. The monitoring wells will be advanced from the ground surface to refusal at the top of competent bedrock and screened across the entire length of the overburden/sapprolite aquifer to approximately one foot above the seasonally high water table.

The bedrock well boring will be installed using HQx rock coring techniques. A bedrock core drill will be advanced and cores collected and inspected for evidence of a water-bearing zone(s). If no water-bearing zone is encountered within 25 feet of total rock penetration, the boring will be abandoned in-place with grout. Detailed monitoring well construction procedures and material requirements are presented in the FSP.

A detailed construction log for each newly installed overburden monitoring well and a detailed bedrock core log well will be prepared and included in the FFS report.

All monitoring wells will be developed as soon as the grout has had sufficient time to cure. A minimum of 10 well volumes plus any water lost to the formation during the bedrock coring program will be removed with a downhole submersible pump or by hand. All development water will be containerized and staged for off-site disposal pending laboratory analytical results or treated with the on-site temporary water treatment system. A detailed development log will be recorded in the field and included in the final report. Detailed well development procedures are included in the FSP.

5.2.4 Groundwater Sampling

Not less than 14 days after installation and development, one complete round of water levels and groundwater samples will be collected from each of the newly installed monitoring wells and up to five existing monitoring wells and submitted for laboratory analysis (Figure 5-6). Groundwater samples will be submitted for analysis of VOCs, biological activity (e.g., metabolic acids) and natural attenuation parameters (Nitrate/Nitrite, Fe(II) [dissolved and total], Sulfate/Sulfide, Alkalinity, Total Organic Carbon, and Hydrogen). Detailed groundwater sampling procedures are presented in the FSP.

Three additional rounds of sampling will be performed on the same set of monitoring wells for the same set of parameters approximately 30 days, 60 days, and 180 days after commencement of the field-scale enhanced anaerobic biodegradation treatability study described in Section 5.2.5.

5.2.5 Field-Scale Treatability Study

A treatability study for the use of electron donor substrate(s) to promote biological reductive dechlorination of the dissolved CVOC plume extending from Site 6 to Site 3 will be conducted. After receipt of all confirmatory soil samples for the Site 6 excavation area but before the excavation is backfilled, a substrate will be mixed into the groundwater to achieve a targeted total organic carbon concentration (TOC) of between 100 and 500 mg/L. Once the substrate has been mixed with the groundwater and prior to backfilling, an infusion gallery distribution system for subsequent substrate injections will be constructed in the open excavation.

Baseline chemical, physical, and biological sampling data will be collected from the existing groundwater monitoring wells prior to any excavation activities. Following the backfilling of the Site 6 excavation and installation of any necessary replacement monitoring wells, groundwater samples will be collected approximately at 30 days, 60 days, and 180 days after the substrate introduction into the groundwater. The results of the test will be used to determine the efficacy of the process and included in the FFS.

5.2.5.1 Baseline Sampling

One site-wide synoptic round of water levels and groundwater samples will be collected and submitted for laboratory analysis from existing monitoring wells prior to any excavation occurring at Site 6. The samples will be analyzed for physical, chemical, and biological parameters and serve as the baseline conditions for the treatability test. The results of the baseline sampling will be used to determine the quantity of substrate, any required additives (nutrients), or augmentation (biology) to be used in the infusion phase. The methods and procedures used to collect and analyze the baseline samples are detailed in the FSP.

The baseline wells to be sampled will be the wells currently existing on-site. These wells include 6MW-09, 6MW-11, 6MW-12, 6MW-13, 6MW-19, and 6MW-20.

5.2.5.2 Infusion Phase

The objective of the treatability study is to promote biological reductive dechlorination of the dissolved CVOC plume. Based on past experience and case studies with dissolved CVOC at numerous DoD facilities, elevated TOC and readily available electron donors (primarily hydrogen) promote destructive dechlorination of PCE and its daughter products (TCE, DCE, and VC) by microbial processes.

The Edible Oil Substrate EOS(™) process involves injection of an emulsion of food-grade oil into the aquifer to stimulate anaerobic biological activity capable of degrading the toxic CVOCs into non-toxic end products. In a two-step reaction carried out by native microorganisms residing in the aquifer, the oil is slowly degraded with the consumption of oxygen and the production of hydrogen. The hydrogen is then available to support the process of reductive dechlorination.

Edible Oil Fermentation

$$C_{18}H_{32}O_2 \text{ (linoleic acid)} + 16\ H_2O \Rightarrow 9\ CH_3COOH \text{ (acetic acid)} + 14\ H_2$$

Dechlorination

$$C_2Cl_4 \text{ (PCE)} + 4\ H_2 \Rightarrow C_2H_4 \text{ (ethene)} + 4\ Cl^- + 4\ H^+$$

The target concentration of TOC necessary to promote dechlorination within the groundwater should be between 100 mg/L and 500 mg/L. To achieve this targeted concentration range, EOS or similar food-grade additive will be mixed into the groundwater in the open excavation. Additional additives (nutrients) or augmentation (biology) may be added based on the baseline testing results.

The total volume of impacted groundwater bounded by the 50 ppb isopleth is estimated to be approximately 90,000 gallons (80 feet x 120 feet x 5 feet saturated thickness x 25% porosity at 7.48 gallons per cubic foot) or 340,000 liters. To achieve a targeted concentration of 500 mg/L will require approximately 170 kgs of available TOC.

For dechlorination of PCE and its daughters, the optimal formulation of EOS® is EOS®598B42 which delivers approximately 0.71 kg/l of organic carbon. Therefore, an estimated quantity of

240 liters or 60 gallons of 100% EOS®598B42 will be required to achieve the targeted concentration of range for TOC.

For the initial infusion of EOS, one 55-gallon drums of 100% substrate will be mixed in the field with approximately 3000 gallons of potable water to dilute the EOS to 5% to maximize dispersion into the groundwater. The mixture will then be pumped into the open Site 6 excavation area prior to backfilling the excavation.

5.2.5.3 Infusion Gallery Construction

Immediately after placement of the EOS mixture, an infusion gallery distribution system will be installed in the open excavation to support, if necessary, any future EOS, nutrient, or additive infusion events. The infusion gallery will consist of four horizontal length wells. The wells will be aligned approximately perpendicular to groundwater flow direction in the overburden aquifer (Figure 5-7). The length of the wells will be based on the overall width of the excavation, but will be at least 60-ft long. The wells will be constructed of 4-inch diameter, Schedule 40 polyvinyl chloride (PVC) 010-slot screen installed below the water table with risers at to grade at each end and in the middle of the horizontal well (Figure 5-8). The wells will be covered with approximately one-foot-thick layer of pea gravel to create a permeable layer for the rapid distribution of additives across the entire plume area. A woven permeable geosynthetic liner will be placed over the pea gravel and the excavation backfilled with stockpiled soils and/or imported common fill if needed.

5.2.5.4 Post-Infusion Monitoring

In order to evaluate the effectiveness of enhanced anaerobic dechlorination, groundwater samples will be collected from each of the seven newly installed monitoring wells and five existing overburden monitoring wells and the one bedrock monitoring well. Samples will be collected from the monitoring well network approximately 30 days, 60 days, and 180 days after the initial infusion. The laboratory results will be used to determine the efficacy of the process.

A reduced list of chemical parameters may be substituted for the full suite of analytes performed in the baseline sampling based on the results of the baseline sampling. Physical and natural attenuation parameters will not be reduced. The methods and procedures used for the post-infusion groundwater monitoring events are included in the FSP.

5.2.6 Surveying

A New York licensed professional land surveyor will survey all boreholes, monitoring wells installed as part of this investigation, and excavation limits. The data will be delivered to Earth Tech in an electronic format and used to generate report figures, as built drawings, and any other maps, which may be required. Survey coordinates will be reported in feet in the New York State Plane NAD83 coordinate system.

5.2.7 Waste Handling and IDW

Approximately 50 cubic yards of soil/sediment from the drainage swale abutting Site 3, 350 cubic yards of impacted soil from Site 3, 1,200 cubic yards of soil from Site 6, and up to eight 55-gallon drums of groundwater from monitoring well development and sampling may require off-site disposal. Additionally, a currently undetermined quantity of soil and scrap materials may be generated based on the results of the investigation of the geophysical anomalies. All management and disposal of the excavated soil will be in accordance with the March 2005 *Policy on Air National Guard Investigation and Remediation Derived Waste (IDW/RDW) Management*.

As previously noted, soil/sediment from the drainage swale will be assumed to be impacted and transported directly off site to an appropriate disposal facility for proper disposal based on waste characterization sampling.

All soils from excavations, cuttings from soil borings, and any containerized wastes will be temporarily staged in pre-determined and prepared staging areas. All impacted soils will be transported directly off site to an appropriate disposal facility for proper disposal based on waste characterization sampling.

A modular temporary water treatment system to treat groundwater that is encountered during remediation activities may be used. Treated groundwater will be discharged to the City of Schenectady's Water Pollution Control Plant (WPCP). The work shall consist of mobilizing the groundwater treatment system and setting the system up adjacent to the excavation areas. Sources of water may include, but not limited to:

- Water from dewatering of excavation area;
- Groundwater from excavation(s);
- Storm water run-off from contaminated areas; and,
- Decontamination water and water from other miscellaneous sources.

Prior to performing any excavations, a groundwater treatment system will be installed to treat contaminated groundwater collected from the areas listed above. Treated groundwater will be stored and sampled for the analyses required by the City of Schenectady's Temporary Water Discharge Permit (Appendix D). If the sample results show levels are below the required discharge limitations, then the treated groundwater will be discharged directly to the sanitary sewer.

The system may include (but not limited to) the following major components:

- Bag Filters;
- Activated Carbon;
- Storage Tank(s); and
- Transfer pumps

A schematic of the temporary water treatment system is shown in Figure 5-9.

All development water from the newly installed monitoring wells will be containerized in 55-gallon DOT approved drums and staged on site pending analytical results of groundwater samples collected from the monitoring wells. Approximately one drum of groundwater will be generated from each monitoring well. Based on the analytical results of groundwater samples collected from each of the monitoring wells, containerized development and purge water from the monitoring wells will be treated with a temporary water treatment system, if still on-site at the time of development, and discharged directly to the surface or transported off site for disposal, if necessary.

IDW, including spent PPE and dedicated, disposable contact sampling equipment (bailers, trowels, rope, etc.), will be accumulated in a 10-yard roll-off container and transported for off-site disposal as necessary.

Non-contact solid waste (trash) will be accumulated in a 10-yard roll-off container and transported off site for disposal as necessary.

A detailed description of waste handling and sampling procedures is contained in the FSP.

5.2.8 Permits

A Base Civil Engineering Work Clearance Request will be required for the IRAs. The Work Clearance Request will be filled out and signed by the appropriate Base Personnel prior to initiating any intrusive activities. The Work Clearance Request will be performed in conjunction with New York Dig Safe utility markout.

A Hot Work permit will need to be submitted to the base Fire Department if any open flame or torch work will be performed.

All water encountered during excavation will be treated with an on-site treatment unit, stored, sampled, and then discharged to the sanitary sewer to be further treated by the City of Schenectady WPCP. A temporary discharge permit has been obtained for this purpose and is shown in Appendix D.

6.0 POST-REMEDIATION HUMAN HEALTH RISK ASSESSMENT (HHRA) AND ECOLOGICAL RISK ASSESSMENT (ERA)

Based on the results of soil, sediment and groundwater sampling conducted in 1998 and 1999 as part of the RI at Schenectady ANGB in Scotia, New York, three potential source areas for soil, surface water, and groundwater contamination was identified for further investigation (IRP Sites 2, 3, and 6). Of the three sites, two are the subject of this IRA (IRP Sites 3 and 6) and have been combined into one remediation area based on the close proximity of the two sites:

- Area 1 includes IRP Sites 3 and 6

A HHRA will be performed for Area 1 using surface and subsurface soil and groundwater data from confirmation sampling collected during the IRA. An ERA will be performed for Area 1 using surface soil, surface water, and sediment data from confirmation sampling collected during the IRA. The purpose of the post-remediation risk assessments is to assess whether chemicals detected in exposure media after remediation represent an unacceptable residual risk to human health and/or ecological receptors. The HHRA will also provide a basis for the evaluation of the success of the implemented response alternatives (USEPA, 1989a).

The HHRA will consist of the screening of confirmation sample results against project human health-based cleanup goals. The ERA will consist of the screening of confirmation sample results against project ecological health-based cleanup goals. Section 6.1 describes the CSM for Area 1. Section 6.2 describes the data analysis and reduction to be performed for the HHRA and ERA. The methodologies for the HHRA and ERA are provided in detail in Sections 6.3 and 6.4, respectively.

6.1 CONCEPTUAL SITE MODEL (CSM) FOR AREA 1

A conceptual site model (CSM) describes the relationships among the receptors, exposure points, transport pathways, and contaminant sources at a site. In accordance with USEPA Risk Assessment Guidance for Superfund (RAGS) (USEPA, 1989a) and the *Hazardous Substance Cleanup Act Guidance Manual* (DNREC, October 1994), risk assessments are intended to address only contaminants for which there is a complete or potentially complete exposure pathway under current and/or future land use conditions. USEPA (1989a) defines a complete or potentially complete exposure pathway as one that consists of the following four elements:

1. A source and mechanism of chemical release;
2. A retention or transport mechanism through an environmental medium;
3. A point of potential contact by human or ecological receptors with the contaminated medium (exposure point); and
4. An exposure route at the exposure point.

If any of these elements are missing, the exposure pathway is considered incomplete, and chemical uptake (i.e., exposure) by that pathway will not be expected to occur.

Pertinent information to be researched for the development of the CSM for Area 1 include the physical setting, contaminated sources and media, potential release and transport pathways, current and potential future land uses, potentially exposed populations, and potentially complete exposure pathways.

6.1.1 Physical Setting for Area 1

Area 1 is located within Schenectady ANGB that occupies approximately 106 acres in the eastern portion of Schenectady County, New York. The Base is located on the Schenectady County Airport and is surrounded on three sides by airport property.

The physical setting for Area 1 including location, size, geology, hydrogeology, potentially contaminated sources and media, and current land uses are described in Sections 4.0 and 5.0 of this work plan.

6.1.2 Identification of Chemicals of Concern (COCs)

All chemicals detected in surface soil, subsurface soil, groundwater, surface water, and sediment during previous investigations for the RI and FS are considered COCs for human health and ecological receptors. Maximum detected concentrations (MDCs) of chemicals in soil, groundwater, and sediment from Area 1 are presented in Table 6-1. The MDCs will be compared to media specific cleanup goals based on residential human exposure to identify human health COCs. The soil MDCs will be compared to soil cleanup goals based on wildlife food chain exposure to identify terrestrial wildlife COCs. The sediment MDCs will be compared to sediment-specific cleanup goals based on protection of benthic organisms to identify sediment COCs. Because groundwater discharges to surface water at the lower end of Area 1, groundwater MDCs will be compared to surface water-specific cleanup goals based on protection of aquatic life to identify water COCs.

Table 6.2 presents the proposed screening values for the selection of human health COCs. Table 6.3 presents the proposed screening values for the selection of ecological COCs.

6.1.3 Contaminated Exposure Media and Potential Pathways for Area 1

Based on a review of the physical setting, historical site operations, and previous environmental investigations, potentially contaminated exposure media at Area 1 include on-Base surface and subsurface soil, ambient air, and groundwater.

Potential contaminant release and transport pathways include generation of fugitive dust from soil to ambient air, volatilization of VOCs from soil to ambient air, volatilization of VOCs from soil and groundwater to indoor air, leaching of contaminants from soil to groundwater, and migration of contaminants in groundwater to off-Base surface water in the Mohawk River if the source areas in the soil and groundwater are not properly remediated.

Tables 6-1 and 6-2 present the preliminary CSM for current exposure pathways for soil at Area 1. Table 6-3 presents the preliminary CSM for future exposure pathways for soil at Area 1. Table 6-4 presents the preliminary CSM for current and future exposure pathways for the groundwater plume that is located in the upper water-bearing unit at Schenectady ANGB.

Table 6-1 Maximum COC Concentrations Detected in Ground Water, Sediment, and Soil

COC	Maximum Ground Water Concentration	Maximum Sediment Concentration	Maximum Surface Soil Concentration
VOCs (µg/L water, µg/kg sediment or soil)			
4-Isopropyltoluene	--	0.7J	1.2
cis-1,2-Dichloroethene	98	ND	--
Tetrachloroethene	3700	0.7J	--
Trichloroethene	48	--	--
Toluene	1.6	--	--
trans-1,2-Dichloroethene	0.7J	1.5J	--
Vinyl chloride	6.5	--	--
SVOCs (µg/L water, µg/kg sediment or soil)			
2-Methylnapthalene	35J	--	--
2-Methyphenol	1J	--	--
Acenaphthene	40J	--	--
Acenaphthylene	--	790	200J
Anthracene	2J	1200	330J
Benzo(a)anthracene	--	510	1500
Benzo(b)fluoranthene	--	720	1800
Benzo(k)fluoranthene	--	2100	610
Benzo(g,h,i)perylene	--	2100	360J
Benzo(a)pyrene	--	500	1200
Bis(2-ethyhexyl)phthalate	11J	55J	89J
Chrysene	--	590	1200
Dibenz(a,h)anthracene	--	580	150J
Dibenzofuran	30J	67J	--
Diethyl phthalate	11J	--	--
Di-n-butyl Phthalate	1J	--	--
Fluoranthene	--	1200	3100
Fluorene	18J	230J	81J
Indeno(1,2,3-cd)pyrene	--	2600	560
Napthalene	3J	--	--
Phenanthrene	8J	660	1500
Phenol	9J		
Pyrene	--	1300	1900
Pest/PCB's (ug/kg)			
4,4'-DDD	0.01J	--	--
4,4'-DDT	0.01J	--	1.5J
Herbicides (µg/L water, µg/kg sediment or soil)			
Dinoseb	0.1	ND	--

Table 6-1 Maximum COC Concentrations Detected in Ground Water, Sediment, and Soil

COC	Maximum Ground Water Concentration	Maximum Sediment Concentration	Maximum Surface Soil Concentration
Pentachlorophenol (PCP)	0.1	ND	3
Picloram	0.05J	ND	--
Total Inorganics (mg/L water, mg/kg sediment or soil)			
Aluminum	37 800	7650	15 200
Antimony	13.7	ND	45.2J
Arsenic	26.8	5.5	6.1
Barium	674	44.9	146
Beryllium	2.7	ND	0.89J
Cadmium	1.5	3.6	2.5
Calcium	266 000	9950	2700
Chromium	55.7	16.4	34.2
Cobalt	57.6	6.3	13.3J
Copper	107	20.8	33.9
Iron	78 000	18 100	32 400
Lead	50.1	52.8	25.8
Magnesium	68 400	9020	7110
Manganese	5290	370	2220J
Mercury	ND	--	0.22
Nickel	130	18.2	32.6
Potassium	17 900	965J	947
Selenium	ND	--	--
Silver	4.3J	1.2	--
Sodium	162 000	420J	384J
Thallium	5J	ND	--
Vanadium	66.7	20	27.8
Zinc	243	128J	107J
Dissolved Inorganics (mg.L)			
Aluminum	56.2J	--	--
Barium	167J	--	--
Beryllium	ND	--	--
Cadmium	ND	--	--
Calcium	165 000	--	--
Chromium	ND	--	--
Cobalt	5.8J	--	--
Copper	2.1J	--	--
Iron	86.6	--	--
Lead	2.9J	--	--
Magnesium	46 800	--	--
Manganese	2680	--	--

Table 6-1 Maximum COC Concentrations Detected in Ground Water, Sediment, and Soil

COC	Maximum Ground Water Concentration	Maximum Sediment Concentration	Maximum Surface Soil Concentration
Nickel	9.5J	--	--
Potassium	13 300	--	--
Silver	ND	--	--
Sodium	85 200	--	--
Thallium	ND	--	--
Vanadium	0.8J	--	--
Zinc	31.7	--	--

Notes:

-- = not analyzed
µg/kg = micrograms per kilogram on a dry-weight basis
µg/L = micrograms per liter
J = indicates an estimated value
mg/kg = milligrams per kilogram on a dry weight basis
mg/L = milligrams per liter
ND = not detected
ng/kg = nanograms per kilogram on a dry-weight basis
SVOCs = semivolatile organic compounds
VOCs = volatile organic compounds

This table lists analytes detected in soil from 0 feet to 2 feet bgs. The table does not include analytes detected at depths greater than 2 feet bgs in soil.

Table 6-2 Human Health Risk-based Ground Water and Soil Cleanup Levels

COC	Ground Water Standard	Ref	Surface Soil Standard ***	Ref
VOCs (µg/L water, mg/kg sediment or soil)				
4-Isopropyltoluene	5	b	NS	
Cis-1,2-Dichloroethene	5	b	43.5 0.40	c d
Tetrachloroethene	5	b	1.4	a
Trichloroethene	5	b	0.7	a
Toluene	5	b	1.5	a
Trans-1,2-Dichloroethene	5	b	0.3	a
Vinyl chloride	2	b	0.2	a
SVOCs (µg/L water, mg/kg sediment or soil)				
2-Methylnapthalene	NS		36.4	a
2-Methyphenol	1800	c	0.100 or MDL	a
Acenaphthene	370	c	50.0**	a
Acenaphthylene	NS		41	a
Anthracene	1800	c	50.0**	a
Benzo(a)anthracene	0.092	c	0.224 or MDL	a
Benzo(b)fluoranthene	0.092	c	1.1	a
Benzo(k)fluoranthene	0.92	c	1.1	a
Benzo(g,h,i)perylene	NS		50.0**	a
Benzo(a)pyrene	0.0092	c	0.061 or MDL	a
Bis(2-ethyhexyl)phthalate	5	b	50.0**	a
Chrysene	9.2	c	0.4	a
Dibenz(a,h)anthracene	0.0092	c	0.014 or MDL	a
Dibenzofuran	12	c	6.2	a
Diethyl phthalate	29000	c	7.1	a
Di-n-butyl Phthalate	50	b	8.1	a
Fluoranthene	1500	c	50.0**	a
Fluorene	240	c	50.0**	a
Indeno(1,2,3-cd)pyrene	0.092	c	3.2	a
Naphthalene	6.2	c	13	a
Phenanthrene	NS		50.0**	a
Phenol	1	b	0.03 or MDL	a
Pyrene	180	c	50.0**	a
Pest/PCB's (ug/kg)				
4,4'-DDD	0.20	b	2.9	a
4,4'-DDT	0.20	b	2.1	a
Herbicides (µg/L water, µg/kg sediment or soil)				
2,4,5-TP (Silvex)	NS		0.7	a

Table 6-2 Human Health Risk-based Ground Water and Soil Cleanup Levels

COC	Ground Water Standard	Ref	Surface Soil Standard ***	Ref
Dinoseb	1	b	61	c
Pentachlorophenol (PCP)	1	b	1.0 or MDL	a
Picloram	50	b	4300	c
Total Inorganics (ug//L water, mg/kg sediment or soil)				
Aluminum	36000	c	SB	a
Antimony	3	b	SB	a
Arsenic	25	b	7.5 or SB	a
Barium	1000	b	300 or SB	a
Beryllium	73	c	0.16 or SB	a
Cadmium	5	b	1 or SB	a
Chromium	50	b	10 or SB	a
Cobalt	730	c	30 or SB	a
Copper	200	b	25 or SB	a
Iron	300	b	2000 or SB	a
Lead	25	b	SB*	a
Manganese	300	b	SB	a
Mercury	0.7	b	0.1	a
Nickel	100	b	13 or SB	a
Selenium	10	b	2 or SB	a
Silver	50	b	SB	a
Thallium	2.4	c	SB	a
Vanadium	36	c	150 or SB	a
Zinc	11000	c	20 or SB	a

Notes:
SB – Site Background
MDL – Method Detection Limit
NS – None specified
* - Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4-61 ppm and in metropolitan or suburban areas or near highways typically range from 200-500 ppm (NYSDEC).
**As per TAGM #4046, Total VOCs<10ppm, Total semi-VOCs<500ppm and individual semi-VOCs<50ppm.
*** Values based on a TOC of 1%. TOC data for subsurface soils ranged from 6,700 (0.67%) to 23,000 mg/kg (2.3%) with a background level of 15,000 mg/kg (1.5%) (RI report, table 6-16).

References:

a - NYSDEC. 1994. Determination of Soil Cleanup Objectives and Cleanup Levels – Technical and Administrative Guidance Memorandum #4046. Division of Environmental Remediation. New York.
b - NYSDEC. 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Division of Water Technical and Operational Guidance Series (1.1.1). New York.
c - USEPA. 2004. Region 9 Preliminary Remediation Goals.
http://www.epa.gov/region9/waste/sfund/prg/files/04prgtable.pdf
d - USEPA. 2004. Region 9 Soil Screening Levels.
http://www.epa.gov/region9/waste/sfund/prg/files/04prgtable.pdf

Table 6-3 Ecological Screening Values for COCs Detected in Surface Water, Sediment, and Soil

COC	Surface Water Screening Value	Ref	Sediment Screening Value	Ref	Surface Soil Screening Value	Ref
VOCs (µg/L water, mg/kg sediment or soil)						
4-Isopropyltoluene	--		--		1,100	d
Cis-1,2-Dichloroethene	--		--		18	d
Tetrachloroethene	98	c	410	f	80	d
Trichloroethene	40	a	220	f	41.8	d
Toluene	6000	a	490	e	114	d
trans-1,2-Dichloroethene	--		--		45.5	d
Vinyl chloride	--		--		0.21	d
SVOCs (µg/L water, mg/kg sediment or soil)						
2-Methylnapthalene	--		300	e	176	d
2-Methyphenol	13	c	12	f	0.089	d
Acenaphthene	520	9	1,400	e	3.54	d
Acenaphthylene	--		--		4.2	d
Anthracene	0.73	c	1,070	e	6.53	d
Benzo(a)anthracene	0.027	c	120	e	2.71	d
Benzo(b)fluoranthene	--		--		4.45	d
Benzo(k)fluoranthene	--		--		4.45	d
Benzo(g,h,i)perylene	--		--		65.8	d
Benzo(a)pyrene	0.014	c	140	f	3.68	d
Bis(2-ethyhexyl)phthalate	3.0	c	1,995	e	0.185	d
Chrysene	--		--		2.68	d
Dibenz(a,h)anthracene	--		--		1.13	d
Dibenzofuran	3.7	c	420	f	0.51	d
Diethyl phthalate	210	c	600	f	0.39	d
Di-n-butyl Phthalate	35	c	11, 000	f	3.82	d
Fluoranthene	--		10,200	e	14.7	d
Fluorene	3.9	c	80	e	4.91	d
Indeno(1,2,3-cd)pyrene	--		--		4.12	d
Naphthalene	12	c	300	e	47.3	d
Phenanthrene	--		1,200	e	797	d
Phenol	*		6	e	0.059	d
Pyrene	--		9,610	e	14.6	d
Pest/PCB's (ug/kg)						
4,4'-DDD	8.00E-05	a	10	e	31.5	d
4,4'-DDT	1.00E-05	a	10	e	13.6	d
Herbicides (µg/L water, µg/kg sediment or soil)						
2,4,5-TP (Silvex)	--		--		2.83	d
Dinoseb	--		--		NS	

Table 6-3 Ecological Screening Values for COCs Detected in Surface Water, Sediment, and Soil

COC	Surface Water Screening Value	Ref	Sediment Screening Value	Ref	Surface Soil Screening Value	Ref
Pentachlorophenol (PCP)	15	b	400	e	3.03	d
Picloram	NS	a	--		NS	
Total Inorganics (ug//L water, mg/kg sediment or soil)						
Aluminum	NS	a	--		484	d
Antimony	NS	a	2	e	10.8	d
Arsenic	63	a	6	e	47	d
Barium	NS	a	--		2,810	d
Beryllium	NS	a	--		731	d
Cadmium	3.8	a	0.6	e	13	d
Chromium	569.8	a	26	e	141	d
Cobalt	NS	a	--		1,540	d
Copper	13.4	a	16	e	182	d
Iron	300	a	200,000	e	1,130	d
Lead	97.1	a	31	e	503	d
Manganese	NS	a	460	e	13,900	d
Mercury	0.0026	a	0.15	e	0.712	d
Nickel	468.2	a	16	e	214	d
Selenium	5.0	b	--		2.25	d
Silver	4.1	a	1	e	61.8	d
Thallium	20	a	--		4.99	d
Vanadium	190	a	--		41	d
Zinc	117.2	a	120	e	259	d
Dissolved Inorganics (mg.L)						
Aluminum	--	a	NA		NA	
Antimony	--	a	NA		NA	
Arsenic	63	a	NA		NA	
Barium	--	a	NA		NA	
Beryllium	--	a	NA		NA	
Cadmium	3.8	a	NA		NA	
Chromium	569.8	a	NA		NA	
Cobalt	--	a	NA		NA	
Copper	13.4	a	NA		NA	
Iron	300	a	NA		NA	
Lead	97.1	a	NA		NA	
Manganese	--	a	NA		NA	
Nickel	0.0026	a	NA		NA	
Silver	468.2	a	NA		NA	
Sodium	5.0	b	NA		NA	

Table 6-3 Ecological Screening Values for COCs Detected in Surface Water, Sediment, and Soil

COC	Surface Water Screening Value	Ref	Sediment Screening Value	Ref	Surface Soil Screening Value	Ref
Thallium	4.1	a	NA		NA	
Vanadium	20	a	NA		NA	
Zinc	190	a	NA		NA	

Notes:
NA – Not applicable

-- No value available

References:

a - New York State Department of Environmental Conservation (NYSDEC). 1999. 6 NYCRR Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. New York. 60 pp.
b – United States Environmental Protection Agency (USEPA). 2002. National Recommended Water Quality Criteria. Office of Water, Office of Science and Technology. EPA-822-R-02-047.
c - Suter II, G. W., and C. L. Tsao. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. ES/ER/TM-96/R2. Prepared for U.S. Department of Energy, Office of Environmental Management. Oak Ridge, TN: Oak Ridge National Laboratory Risk Assessment Program, Health Sciences Research Division
d - Food chain model based on lowest of robin, mourning dove, deer mouse, or short-tailed shrew risk-based cleanup goals.
e – NYSDEC. 1993. Technical guidance for screening contaminated sediments. Division of Fish and Wildlife. Division of Marine Resources. New York. 36 pp. (assume TOC=1 percent)
f - Jones, D. S., G. W. Suter II, and R. N. Hull. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision. ES/ER/TM-95/R4. Oak Ridge, TN: Oak Ridge National Laboratory.
g –Buchman, M. F., 1999. NOAA Screening Quick Reference Table (SQuiRT), NOAA HAZMAT Report 99-1, Seattle WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration

6.1.4 Potentially Exposed Receptors and Exposure Pathways for Area 1

There are no current on-site residents at Area 1. In addition, the Base currently eliminates access by trespassers via Base fencing and administrative controls. The following current receptors may be potentially exposed to site-related contaminants based on current land use:

Current Land Use for Area 1

- Current on-site industrial workers at Area 1 (IRP Sites 3 and 6).

Based on site characteristics and historical site data, several hypothetical future human receptors may be exposed to site-related contaminants based on potential future land use:

Future Land Use for Area 1

- Hypothetical future on-site industrial workers who are assumed to work on site.
- Hypothetical future on-site construction workers who are assumed to perform excavation activities that disturb site subsurface soil.
- Hypothetical future off-Base residents located at the boundaries of the Base who may be exposed (via potable uses) to contaminants in the upper water-bearing unit if it has migrated from Area 1 to the Base boundary.

Groundwater in the upper water-bearing unit will be characterized and evaluated for the risk assessment as a single plume. Area 1 will be investigated as a potential source area for this groundwater plume.

The State of New York has developed soil cleanup levels and these values are published in Technical and Administrative Guidance Memorandum # 4046 (TAGM). The basis of the soil cleanup objectives are:

1. Human-health-based levels that correspond to excess lifetime cancer risks of one in a million for Class A and B carcinogens, or 1 in 100,000 for Class C carcinogens.

2. Human-health-based levels for systemic toxicants, calculated from reference doses (RfDs). RfDs are an estimate of the daily exposure an individual (including sensitive individuals) can experience without appreciable risk of health effects during a lifetime. An average scenario of exposure in which children ages 1 to 6 is assumed. An intake rate of 200 mg per day for a five-year exposure period for a 16-kg child is assumed.

3. Environmental concentrations which are protective of groundwater/drinking water quality; based on promulgated or proposed New York State standards;

Thus the TAGM soil cleanup goals are protective of unrestricted residential exposure scenarios. As such, they may be overprotective of identified current and future land uses for Area 1 (see above).

Tables 6-1 and 6-2 present the preliminary CSM for current exposure pathways for soil at Area 1. Table 6-3 presents the preliminary CSM for future exposure pathways for soil at Area 1. Table 6-4 presents the preliminary CSM for current and future exposure pathways for the groundwater plume that is located in the upper water-bearing unit at Schenectady ANGB.

Based on site-specific data collected during the IRA, the CSM may be modified for the site-specific HHRA. This table presents the possible exposure pathways for the identified potential receptors and provides rationale for each exposure pathway indicating whether it is potentially complete and significant, potentially complete but insignificant, or incomplete. Only potentially complete, significant exposure pathways will be quantitatively evaluated in the HHRA. Table 6-6 summarizes the specific exposure pathways that are considered potentially complete. The TAGM values used as cleanup goals for this project are protective of residential exposure pathways and risk to hypothetical future on-site industrial workers is expected to be less than potential risk for a future off-site resident; consequently, TAGM-based cleanup values are considered protective of all identified human exposure pathways.

6.2 DATA REDUCTION AND ANALYSIS FOR THE RISK ASSESSMENTS FOR AREA 1

Analytical data from confirmation sampling of Area 1 will undergo a qualitative review for use in the risk assessments, but this data will not be included in the risk assessments for quantitative analysis. Only the confirmatory analytical data for this removal action will be included for the quantitative estimates of risk for the HHRA and ERA.

Adequate data quality will be assured through the implementation of standard operating procedures during data collection, quality control checks using field and laboratory blank analyses, and data validation. Laboratory data to be used for the HHRA and ERA will undergo data validation by a third party for compliance with QC requirements as outlined in the QAPP. Ten percent of the laboratory data will undergo complete data validation and ninety percent will undergo a data quality review. A detailed discussion of QA/QC procedures for this investigation is presented in the QAPP.

Table 6-4 Selection of Current Soil Exposure Pathways for the Human Health Risk Assessment for Area 1

Scenario Time-frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On Site/ Off Base	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil	Surface Soil	Surface Soil	Resident	Adult Child	Dermal Ingestion	Off-Base	None	Current off-Base residents do not have access to the site; therefore, this receptor is not expected to come into direct contact with on-site surface soil.
				Industrial Worker	Adult	Dermal Ingestion	On Site	Quant	Incidental soil ingestion and dermal contact with on-site surface soil are considered potentially complete exposure pathways for current on-site industrial workers who may contact surface soil.
		Plant and Animal Tissue	Fruits, Vegetables and Livestock	Industrial Worker	Adult	Ingestion	On Site	None	There are currently no agricultural activities on site.
		Air	Suspended Particulates	Resident	Adult Child	Inhalation	Off Base	None	Although receptors may be exposed to fugitive dust, exposure for off-Base residents is considered potentially complete but insignificant because of the distance between the site and the off-Base receptor.
				Industrial Worker	Adult	Inhalation	On Site	Quant	Inhalation of fugitive dust is considered a potentially complete exposure pathway for current on-site industrial workers who may contact surface soil.
	Subsurface Soil	Subsurface Soil	Subsurface Soil	Resident	Adult Child	Dermal Ingestion	Off-Base	None	Current off-Base residents do not have access to the site; therefore, this receptor is not expected to come into direct contact with on-site subsurface soil.
				Industrial Worker	Adult	Dermal Ingestion	On Site	None	Current on-site industrial workers are not expected to come into direct contact with on-site subsurface soil.
		Plant and Animal Tissue	Fruits, Vegetables and Livestock	Industrial Worker	Adult	Ingestion	On Site	None	There are currently no agricultural activities on site.

Table 6-4 (Continued)
Selection of Current Soil Exposure Pathways for the
Human Health Risk Assessment for Area 1

Scenario Time-frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On Site/ Off Base	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface and Subsurface Soil	Air	Volatile Organic Compounds (VOCs)	Resident	Adult Child	Inhalation	Off Base	None	VOCs may volatilize into soil air spaces and migrate to the soil surface where they may be emitted to the atmosphere. Exposure for off-Base residents, although potentially complete, is considered insignificant because of the distance between the site and off-Base residents.
				Industrial Worker	Adult	Inhalation	On Site	Quant	On-site workers may be exposed to VOCs that volatilize into soil air spaces and migrate to the soil surface where they may be emitted to the atmosphere. VOCs are not expected to migrate from soil through building foundations exposing on-site industrial workers via indoor air because there are no buildings located in Area 1.

Table 6-5 Selection of Future Soil Exposure Pathways for the Human Health Risk Assessment for Area 1

Scenario Time-frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On Site/ Off Base	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Surface and Subsurface Soil	Surface and Subsurface Soil	Surface Soil	Resident	Adult Child	Ingestion Dermal	On site	None	The Base is an active industrial facility and there are no current on-Base residents. It is anticipated that the Base will remain an active facility in the future; therefore, it is not anticipated that the site will be used for a future residence.
				Industrial Worker	Adult	Ingestion Dermal	On Site	Quant	Future on-site workers may be exposed to surface soil. Because future excavation activities may bring subsurface soil to the surface, this receptor may also be potentially exposed to excavated subsurface soils. Therefore, incidental soil ingestion and dermal contact with surface and subsurface soil are potentially complete exposure pathways for this receptor.
				Construction Worker	Adult	Ingestion Dermal	On Site	Quant	Future on-site construction workers may be exposed via incidental ingestion of, and dermal contact with, surface and subsurface soil during excavation activities.
		Plant and Animal Tissue	Fruits, Vegetables, and Livestock	Resident	Adult Child	Ingestion	On Site	None	The Base is an active industrial facility and there are no current on-Base residents. It is anticipated that the Base will remain an active facility in the future; therefore, it is not anticipated that the site will be used for a future residence.
				Industrial Worker	Adult	Ingestion	On Site	None	It is assumed that there will be no agricultural activities on site.

Table 6-5 (Continued)
Selection of Future Soil Exposure Pathways for the Human Health Risk Assessment for Area 1

Scenario Time-frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On Site/ Off Base	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Surface and Subsurface Soil	Air	Suspended Particulates	Resident	Adult Child	Inhalation	On Site/ Off Base	None	The Base is an active industrial facility and there are no current on-Base residents. It is anticipated that the Base will remain an active facility in the future; therefore, it is not anticipated that the site will be used for a future residence. Although off-Base residents may be exposed to fugitive dust, exposure is considered potentially complete but insignificant because of the distance between the site and the off-Base receptor.
				Industrial Worker	Adult	Inhalation	On Site	Quant	Future on-site workers may be exposed to fugitive dust from surface soil. Because future excavation activities may bring subsurface soil to the surface, this receptor may also be potentially exposed to excavated subsurface soils. Therefore, inhalation of fugitive dust from surface/subsurface soil is a potentially complete exposure pathway for this receptor.
				Construction Worker	Adult	Inhalation	On Site	Quant	Future on-site construction workers may be exposed via inhalation of fugitive dust generated from surface and subsurface soil during excavation activities.

Table 6-5 (Continued)
Selection of Future Soil Exposure Pathways for the Human Health Risk Assessment for Area 1

Scenario Time-frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On Site/ Off Base	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Surface and Subsurface Soil	Air	VOCs	Resident	Adult Child	Inhalation	On Site/ Off Base	None	The Base is an active industrial facility and there are no current on-Base residents. It is anticipated that the Base will remain an active facility in the future; therefore, it is not anticipated that the site will be used for a future residence. VOCs may volatilize into soil air spaces and migrate to the soil surface where they may be emitted to the atmosphere. Exposure for off-Base residents, although potentially complete, is considered insignificant because of the distance between the site and off-Base residents.
				Industrial Worker	Adult	Inhalation	On Site	Quant	Future on-site workers may be exposed to VOCs that volatilize into soil air spaces and migrate to the soil surface where they may be emitted to the atmosphere. In addition, VOCs may migrate from soil through building foundations exposing on-site industrial workers via indoor air.
				Construction Worker	Adult	Inhalation	On Site	Quant	Future on-site construction workers may be exposed via inhalation of VOCs from surface and subsurface soil emitted to the atmosphere during excavation activities.

Table 6-6 Selection of Current and Future Groundwater Exposure Pathways for the Human Health Risk Assessment for Area 1

Scenario Time-frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On Site/ Off Base	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Overburden Groundwater	Overburden Groundwater	Potable Use, Direct Contact, and Indirect Exposure	Resident	Adult Child	Dermal Ingestion Inhalation	Off Base	None	Potable water used by off-Base residents is supplied the Town of Glenville, from the Great Flats aquifer. Site-related contaminants in groundwater from the upper water-bearing unit are not known to have migrated beyond Base boundaries; therefore, current off-Base residents are not expected to be exposed to site-related contaminants in the upper water-bearing unit via potable use, direct contact, or VOCs migrating from the upper water-bearing unit to indoor air.
				Industrial Worker	Adult	Dermal Ingestion	On Site	None	<u>*Potable:*</u> Groundwater from the upper water-bearing unit is not currently being used as a potable water supply at the Base. Potable water for the Base is currently supplied by the Town of Glenville from the Great Flats aquifer. <u>*Direct Contact:*</u> Current on-site industrial workers are not expected to come into direct contact with groundwater via non-potable use.
						Inhalation	On Site	Quant	<u>*Indirect Exposure:*</u> Current on-site industrial workers are not expected to be exposed to VOCs that migrate from groundwater through the soil column and building foundations to indoor air.
		Plant and Animal Tissue	Fruits, Vegetables and Livestock	Resident	Adult Child	Ingestion	Off Base	None	Site-related contaminants in groundwater from the upper water-bearing unit are not known to have migrated beyond Base boundaries; therefore, current off-Base residents are not expected to be exposed to site-related contaminants in groundwater from the upper water-bearing unit via agricultural uses.
				Industrial Worker	Adult	Ingestion	On Site	None	There are currently no agricultural activities occurring on site.

Table 6-6 (Continued)
Selection of Current and Future Groundwater Exposure Pathways for the Human Health Risk Assessment for Area 1

Scenario Time-frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On Site/ Off Base	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Overburden Groundwater	Overburden Groundwater	Potable Use, Direct Contact, and Indirect Exposure	Resident	Adult Child	Dermal Ingestion Inhalation	Off Base	Quant	<u>*Potable:*</u> Potable water used by off-Base residents is currently supplied by Town of Glenville, NY from the Great Flats aquifer. Site-related contaminants in groundwater from the upper water-bearing unit are not known to have migrated beyond Base boundaries; however, site-related contaminants in the upper water-bearing unit may migrate beyond the boundaries of the Base in the future. Therefore, future off-Base residents located at the Base boundaries may be exposed to site-related contaminants in groundwater from the upper water-bearing unit via potable uses (including inhalation of VOCs from groundwater while showering). <u>*Direct Contact*</u>: Although site-related contaminants in groundwater in the upper water-bearing unit may migrate beyond the boundaries of the Base in the future, future off-Base residents are not expected to come into direct contact with groundwater via non-potable use.
						Inhalation	Off Base	Quant	<u>*Indirect Exposure:*</u> Site-related contaminants in groundwater from the upper water-bearing unit are not known to have migrated beyond Base boundaries; however, site-related contaminants in the upper water-bearing unit may migrate beyond the boundaries of the Base in the future. Therefore, future off-Base residents located at the Base boundaries may be exposed to VOCs that migrate from the upper water-bearing unit through the soil column and building foundations to indoor air.

Table 6-6 (Continued)
Selection of Current and Future Groundwater Exposure Pathways for the Human Health Risk Assessment for Area 1

Scenario Time-frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On Site/ Off Base	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Overburden Groundwater	Overburden Groundwater	Potable Use, Direct Contact, and Indirect Exposure	Industrial Worker	Adult	Dermal Ingestion Inhalation	On Site	Quant	_Potable:_ Potable water used by on-site workers is currently supplied by the Town of Glenville from the lower water-bearing unit. Although it is anticipated that on-site workers will continue to obtain potable water from the Town of Glenville, a future on-site worker could be exposed to site-related contaminants if groundwater from the upper water-bearing unit is used for potable purposes. _Direct Contact:_ Future on-site industrial workers are not expected to come into direct contact with groundwater via non-potable use.
				Industrial Worker	Adult	Inhalation	On Site	Quant	_Indirect Exposure:_ Future on-site industrial workers may be exposed to VOCs that migrate from groundwater through the soil column and building foundations to indoor air.
				Construction Worker	Adult	Dermal Ingestion Inhalation	On Site	None	_Direct Contact:_ Because the depth of the upper water-bearing unit is relatively shallow, future construction workers could contact groundwater during excavation activities.
		Plant and Animal Tissue	Fruits, Vegetables and Livestock	Resident	Adult Child	Ingestion	Off Base	None	It is assumed that groundwater in the upper water-bearing unit will not be used for agricultural purposes in the future by off-Base residents.
				Industrial Worker	Adult	Ingestion	On Site	None	There are currently no agricultural activities occurring on-site and it is not anticipated that agricultural activities will occur on-site in the future.

Table 6-7 Summary of Potentially Complete Exposure Pathways to be Quantitatively Evaluated for Area 1

Current Exposure Pathways for Area 1		
Receptor	**Medium**	**Exposure Pathway**
On-Site Industrial Worker at Area 1	Surface Soil	Ingestion
		Dermal Contact
		Inhalation of Fugitive Dust (ambient air)
	Surface and Subsurface Soil	Inhalation of VOCs (ambient air)
Future Exposure Pathways for Area 1		
Receptor	**Medium**	**Exposure Pathway**
Off-Base Resident	Groundwater (Potable Use)	Ingestion
		Dermal Contact
		Inhalation of VOCs (while showering)
	Groundwater	Inhalation of VOCs (indoor air)
On-Site Industrial Worker	Groundwater (Potable Use)	Ingestion
		Dermal Contact
		Inhalation of VOCs (while showering)
	Surface/Subsurface Soil and Groundwater	Inhalation of VOCs (indoor air)
	Surface and Subsurface Soil	Ingestion
		Dermal Contact
		Inhalation of Fugitive Dust (ambient air)
		Inhalation of VOCs (ambient air)

Table 6-7 (Continued)
Summary of Potentially Complete Exposure Pathways to be Quantitatively Evaluated for Area 1

Future Exposure Pathways for Area 1		
Receptor	**Medium**	**Exposure Pathway**
On-Site Construction Worker	Surface and Subsurface Soil	Incidental Ingestion
		Dermal Contact
		Inhalation of Fugitive Dust (ambient air)
		Inhalation of VOCs (ambient air)

6.2.1 Summary of Basic Quantitative Data Characteristics

Basic quantitative characteristics of the post-remediation confirmation soil and water analytical data will be summarized using common descriptive statistics. Prior to calculating the statistics, data collected to confirm that cleanup has met NYSDEC requirements will be reviewed to determine its appropriateness for the HHRA and ERA. Both surface soil (0 to 1 foot bgs) data and subsurface soil (> 1 foot bgs) data will be used in the HHRA. Only surface soil data will be used in the ERA. Groundwater confirmation samples will be used in the HHRA. Surface water and sediment confirmation samples will be used in the ERA.

Validated laboratory data will be reduced and converted into a format that is useable in the risk assessments. All analytical results will be evaluated for usability in the HHRA and ERA. Specifically, analytical results will be evaluated to identify any rejected ("R" qualified) or otherwise unusable data; unusable results will be eliminated from the database prior to additional data reduction or data summarization efforts. All other qualified analytical data will be used in the HHRA and ERA per USEPA guidance (USEPA, 1989a and USEPA, 1992a).

All duplicate or diluted analyses will be reduced to useable form by the following procedure:

- When both the original and duplicate (or diluted) samples have detected concentrations, the higher of the concentrations will be used in the reduced data set;
- When both the original and duplicate (or diluted) samples are nondetects, the lower of the practical quantitation limits (PQLs) will be used in the reduced data set;
- If one of the original or duplicate (or diluted) samples has a detected concentration, but the other is a nondetect, the detected concentration will be used in the reduced data set.

Descriptive statistics will be calculated for the post-remediation HHRA and SERA and Tier II HHRA and BERA (if required). The reduced data set will be used to calculate the following descriptive statistics (USEPA, 2000b):

1. Number of samples,
2. Frequency of detection,
3. Maximum detected concentration (MDC),
4. Arithmetic mean concentration,
5. Range of minimum and maximum detected concentrations,
6. Range of sample quantitation limits (i.e., sample adjusted PQLs), and
7. For the Tier II assessment, the 95% upper confidence limit (UCL) of the arithmetic mean.

6.3 DETAILS OF THE POST-REMEDIATION HHRA FOR AREA 1

This section provides the specific methodology that will be used for the post-remediation HHRA that will be conducted for Area 1 at Schenectady ANGB. Immediately following data reduction and analysis, a conservative screening process will be used as described below. All chemicals having toxicity data that were detected in one or more environmental samples will be evaluated. NYSDEC TAGAM values will be used to screen confirmation surface soil, subsurface soil, and groundwater samples

Chemicals that are considered essential human nutrients that have no available toxicity values (i.e., sodium, potassium, magnesium, calcium) will be eliminated as COCs. For chemicals that have no available NYSDEC TAGAM values for soil or water, cleanup goals will be developed from USEPA, Region 9 Preliminary Remediation Goals (PRGs). For chemicals that have no available toxicity data and are not considered essential human nutrients, surrogate post-remediation screening criteria (i.e., screening criteria for a different chemical with similar toxicological properties) may be used (where appropriate) for the post-remediation risk evaluation. The post remediation screening HHRA will identify all surrogate screening criteria that are used and will qualitatively discuss their use in the uncertainty analysis of the HHRA. For chemicals where screening criteria have not been established, and surrogate screening criteria cannot be identified, the chemicals will be eliminated from the screening evaluation. Elimination of these chemicals will be discussed qualitatively in the uncertainty section of the screening HHRA.

If a chemical does not exceed its screening criteria for any medium, the chemical will be eliminated from further evaluation in the HHRA and remediation for that chemical will be considered complete with respect to human health risk. If no chemical detected in a specific medium exceeds its screening criteria, the medium will be eliminated from further evaluation in the HHRA and remediation of that medium will be considered complete with respect to human health risk.

6.3.1 Uncertainty Analysis

Uncertainties associated with the post-remediation HHRA and ERA will be qualitatively evaluated for accuracy of the approach. For example, uncertainty is inherent in the process of data sampling and analysis, data evaluation, and assumptions on current and future land uses. Uncertainty in the assessment could arise if screening criteria are less than chemical PQLs. Uncertainty is associated with the use of screening criteria that are based only on exposure via ingestion and does not consider exposure via dermal contact and inhalation. Uncertainty may also arise if chemicals lack screening criteria or surrogate screening criteria is used. The uncertainty analysis will indicate whether the effect of these factors on estimates of risk in the screening HHRA and ERA is likely to overestimate or underestimate risk, or whether the impact of uncertainty on the risk estimates is unknown.

An evaluation of sample quantitation limits [SQLs] (i.e., PQLs adjusted for sample-specific characteristics such as moisture content and analytical requirements such as dilution) achieved for sample analyses will be conducted. The purpose of the evaluation is to ensure that the SQLs are low enough to meet the requirements for completing the quantitative risk assessments. If SQLs are higher than a risk-based value for a given matrix, a risk assessor may not be able to make a quantitative statement regarding the potential risk posed by those chemicals. The SQL analysis will consist of a comparison of the SQL for each analytical result to the risk-based screening criteria to determine whether any chemical SQLs exceed these criteria. Chemicals having SQLs that exceed risk-based screening criteria will be discussed qualitatively in the uncertainty section of the HHRA and ERA to indicate the potential for underestimating risk.

6.4 ECOLOGICAL RISK ASSESSMENT

The ecological risk assessment will estimate the potential exposure and adverse effects on aquatic life, benthic organisms, and terrestrial wildlife after the remediation is complete. As with the HHRA, confirmation sample will be used to estimate post remediation exposure of ecological receptors and the resulting risk of adverse effects. Section 6.4.1 summarizes the ecological exposure pathways, and includes assessment and measurement endpoints. Section 6.4.2 summarizes the risk assessment process including the toxicity values and sources and representative wildlife species.

6.4.1 Exposure Pathways for Ecological Receptors

Surface water and sediment are found in an unnamed drainage ditch to the Mohawk River that is located along the western boundary of Area 1. The unnamed tributary originates from the culvert outfall of part of the Base storm water system, however, base-flow can be observed at times not associated with precipitation events. This suggests that there is some groundwater discharges to the unnamed tributary. Chemicals in soils from the site may have washed into the unnamed tributary and deposited as sediment in the stream or the ponded area behind the weir/oil-water separator. Chemicals in sediment may be contacted by benthic organisms or chemicals may partition from the sediment into the water column where aquatic life, such as fish, may be contacted. Surface water from Area 1 ultimately discharges to the Mohawk River after flowing overland approximately 1 mile. The unnamed tributary traverses several residential and industrial properties after it leaves the Schenectady ANGB.

Table 6-8 Summary of Assessment and Measurement Endpoints

Receptor of Concern	Exposure Pathway	Assessment Endpoint *	Testable Hypothesis	Measurement Endpoint	Data Available
Aquatic Life	Direct Contact with chemicals in Surface Water	Protection and maintenance (survival, growth, and reproduction) of aquatic life.	The concentration of chemicals in surface water does not exceed a level known to be toxic to aquatic life.	Compare concentration of chemicals in surface water to risk-based water benchmark concentrations developed to protect survival and growth of aquatic life.	Site-specific chemical data for surface water from the unnamed tributary
Benthic Organisms	Direct Contact with chemicals in Sediment	Protection and maintenance (survival, growth, and reproduction) of benthic life.	The concentration of chemicals in sediment does not exceed a level known to be toxic to benthic invertebrates.	Compare concentration of chemicals in sediment to effects-based sediment benchmark concentrations developed to protect survival and growth of benthic invertebrates.	Site-specific chemical data for sediment from the unnamed tributary.
Small herbivorous mammals (represented by deer mouse and meadow vole)	Ingestion of chemicals accumulated in plants, soil invertebrates and from soil	Protection and maintenance (survival, growth, and reproduction) of small herbivorous mammals.	The ingestion of bioaccumulative chemicals in surface soil invertebrates does not exceed a level known to be toxic to mice.	Compare modeled chronic cleanup goals for a representative herbivorous mammal species to risk-based soil cleanup levels.	Site-specific chemical data for surface soil from potentially impacted locations

Table 6-8 Summary of Assessment and Measurement Endpoints

Receptor of Concern	Exposure Pathway	Assessment Endpoint *	Testable Hypothesis	Measurement Endpoint	Data Available
Small insectivorous mammals (represented by ornate shrew)	Ingestion of chemicals accumulated in soil invertebrate, insects, and from soil	Protection and maintenance (survival, growth, and reproduction) of small insectivorous mammals.	The ingestion of bioaccumulative chemicals in surface soil and soil invertebrates does not exceed a level known to be toxic to ornate shrews.	Compare modeled chronic cleanup goals for a representative insectivorous mammal species to risk-based soil cleanup levels.	Site-specific chemical data for surface soil from potentially impacted locations
Carnivorous mammals (represented by long-tailed weasel)	Ingestion of chemicals accumulated in small mammals, birds, and from soil	Protection and maintenance (survival, growth, and reproduction) of carnivorous mammals.	The ingestion of bioaccumulative chemicals in small mammals, birds, and soil does not exceed a level known to be toxic to the long-tailed weasel.	Compare modeled chronic cleanup goals for a representative carnivorous mammal species to risk-based soil cleanup levels	Site-specific chemical data for surface soil from potentially impacted locations
Small herbivorous birds (represented by mourning dove)	Ingestion of chemicals accumulated in plants and from soil	Protection and maintenance (survival, growth, and reproduction) of small herbivorous birds.	The ingestion of bioaccumulative chemicals in plants and surface soil does not exceed a level known to be toxic to birds.	Compare modeled chronic cleanup goals for a representative herbivorous bird species to risk-based soil cleanup levels	Site-specific chemical data for surface soil from potentially impacted locations
Small insectivorous birds (represented by American robin)	Ingestion of chemicals accumulated in soil invertebrates, insects, and from soil	Protection and maintenance (survival, growth, and reproduction) of small insectivorous birds.	The ingestion of bioaccumulative chemicals in surface soil and soil invertebrates does not exceed a level known to be toxic to the American robin	Compare modeled chronic cleanup goals for a representative insectivorous bird species to risk-based soil cleanup levels	Site-specific chemical data for surface soil from potentially impacted locations

Notes:

* Assessment endpoints identified for evaluation in this SRA are based on the parameters used to derive toxicity benchmarks (see Measurement Endpoint column) and are not intended to imply measurement of these parameters in the field.

Site-related contaminants in groundwater from the upper water-bearing unit are not known to have migrated beyond Base boundaries; however, site-related contaminants in the upper water-bearing unit may discharge to the unnamed tributary where they could contact aquatic life and migrate beyond the boundaries of the Base to the Mohawk River.

Terrestrial animals may be exposed to site chemicals through:

- Incidental ingestion of soil or sediment with food or while grooming,
- Ingestion of chemicals in plants that have taken up the chemical from the soil,
- Ingestion of chemicals in soil invertebrates that have taken up the chemical from the soil, and
- Terrestrial animals may drink water from the contaminated surface water body.

Proposed assessment endpoints and pathways are summarized in Table 3-4.

6.4.2 Details of the Post-remediation ERA for Area 1

This section provides the specific methodology that will be used for the post-remediation ERA that will be conducted for Area 1 at Schenectady ANGB. Immediately following data reduction and analysis, a conservative screening process will be used as described below. All detected chemicals having toxicity data that were detected in one or more environmental samples will be evaluated. Chemicals that are considered essential nutrients (i.e., sodium, potassium, magnesium, calcium, and iron) will be eliminated as COCs. Ecological screening values for surface water were taken from a hierarchy of sources:

1. New York State Department of Environmental Conservation (NYSDEC). 1999. 6 NYCRR Part 703 *Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations.* New York. 60 pp. (Fresh water aquatic life-chronic values)

2. United States Environmental Protection Agency (USEPA). 2002. *National Recommended Water Quality Criteria.* Office of Water, Office of Science and Technology. EPA-822-R-02-047. (Fresh water aquatic life-chronic values)

3. Suter II, G. W., and C. L. Tsao. 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision*. ES/ER/TM-96/R2. Prepared for U.S. Department of Energy, Office of Environmental Management. Oak Ridge, TN: Oak Ridge National Laboratory Risk Assessment Program, Health Sciences Research Division

Ecological screening values for sediment were taken from the following sources:

1. NYSDEC. 1993. *Technical guidance for screening contaminated sediments.* Division of Fish and Wildlife. Division of Marine Resources. New York. 36 pp. (assume TOC=1 percent).

2. Jones, D. S., G. W. Suter II, and R. N. Hull. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision. ES/ER/TM-95/R4. Oak Ridge, TN: Oak Ridge National Laboratory

Ecological screening values for soil are based on terrestrial wildlife food-chain exposure modeling. The general methodology presented by USEPA (2005) in *Ecological Soil Screening Level Guidance* was used to calculate LOAEL-based soil cleanup levels using the exposure factors for the following representative species:

- Deer mouse,
- Meadow vole,
- Short-tailed shrew,
- American robin,
- Mourning dove, and
- Long-tailed weasel.

The lowest estimated cleanup level for the six species will be selected for screening. The proposed risk-based screening values are presented in Table 3-3.

If a confirmation sample chemical does not exceed its screening criteria for any medium, then the chemical will be eliminated from further evaluation in the ERA and remediation for that chemical will be considered complete with respect to ecological risk. If no chemical detected in a specific medium exceeds its screening criteria, the medium will be eliminated from further evaluation in the ERA and remediation of that medium will be considered complete with respect to ecological risk.

7.0 FOCUSED FEASIBILITY STUDY

The FFS will include the compilation of remedial action objectives, criteria for selection of the evaluated remedial alternatives, and descriptions of potential remedial action alternatives to be developed in the FFS, as discussed below. The FFS will be developed on for Site 6 groundwater only since the IRAs as described under Section 5 will require no further action for Sites 3 and 6 soils and no site related contamination of the Site 3 groundwater was identified during the RI.

7.1 REMEDIAL ACTION OBJECTIVES

The remedial action objectives for the Site 6 groundwater are:

- Prevent further migration of overburden groundwater contamination,
- Prevent human exposure to COCs posing potential health threats,,and
- Comply with SSALs for groundwater.

7.2 REMEDIAL ALTERNATIVE EVALUATION PROCESS

Alternatives will be developed for remediation of groundwater at Site 6. Based on results and interpretation of RI data and previously documented FS, the FFS will include detailed evaluations of a no action remedy, two active remedial alternatives, and monitored natural attenuation. The objective of the remedial alternatives evaluation is to meet the site's remedial action objectives and comply with USEPA and HSCA guidance. The evaluation of alternatives in this study is based on criteria established by the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)* (USEPA, 1988). The alternatives will be evaluated with respect to the first seven of the nine remedy selection criteria. The last two criteria will not be addressed until the preferred remedy is selected. NYSDEC acceptance and community acceptance will be addressed in the Proposed Plan and Record of Decision. The seven evaluation criteria and evaluation details are as follows:

1. ***Overall Protection of Human Health and the Environment***. This criterion describes how the remedial alternative achieves and maintains protection of human health and the environment. This evaluation describes how site risks are eliminated, reduced, or controlled. Risk reduction supported by numerical estimates of risk posed to site workers or other receptors during and after remediation will be included, if required, to evaluate protection of human health and the environment.
2. ***Compliance with Applicable Regulations.*** This evaluation criterion is used to determine whether each alternative will meet all applicable regulations. These include chemical-, location-, and action-specific regulations.
3. ***Long-Term Effectiveness and Permanence***. This evaluation criterion is used to measure the risk remaining at a site after response objectives have been met. The evaluation will focus on the magnitude of residual risk as well as the adequacy and reliability of controls (i.e., engineering or institutional). Residual risk is the risk remaining from untreated waste or treatment residuals upon completion of remedial activities. The magnitude of residual risk will be evaluated using numerical standards such as the volume or concentrations of contaminants in waste, media, or treatment residuals remaining on site.

4. ***Reduction of Toxicity, Mobility, or Volume through Treatment***. This evaluation criterion addresses the statutory preference for remedial alternatives capable of permanently and significantly reducing toxicity, mobility, or volume of the hazardous substances through treatment. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of contaminants, reduction of the total mass or volume of contaminants, or irreversible reduction in contaminant mobility.
5. ***Short-Term Effectiveness.*** This evaluation criterion addresses the effects of the remedial alternative during the construction and implementation phase until remedial response objectives are met (e.g., a target cleanup goal has been met). Under this criterion, alternatives will be evaluated with respect to their effects on human health and the environment during implementation of the remedial action.
6. ***Implementability.*** The implementability criterion addresses the technical and administrative feasibility of implementing a remedial alternative and the availability of required services and materials. This criterion includes technical feasibility (i.e., technical difficulties, reliability, monitoring requirements, and safety); administrative feasibility (i.e., permitting and coordination with regulatory agencies); and availability of services and materials (i.e., equipment, personnel, and materials).
7. ***Cost***: A cost including both capital and operation and maintenance costs will be estimated for each alternative.

7.3 POTENTIAL REMEDIAL ACTION ALTERNATIVES

Remedial action alternatives evaluated in this FFS may include remediation technologies recommended in the Site 6 FS (ANEPTEK, 2002). Additional alternatives may be considered for screening because the results of the enhance biodegradation pilot study will not be available until the IRAs are complete. The final FFS will include the evaluation of two active remedial alternatives, in addition to the no action alternative and monitored natural attenuation (MNA). Technologies being considered for treatment groundwater are listed below.

7.3.1 Groundwater Treatment Technologies

Groundwater treatment technologies include bioremediation and chemical oxidation. The bioremediation treatment technology recommended in the previous FS will continue to be the preferred technology if the results of the treatability study prove favorable. If the treatability study results do not prove favorable another technology, such as air sparging, will be evaluated.

7.3.2 Monitored Natural Attenuation

Field chemical and laboratory analytical data will be used together to evaluate intrinsic bioremediation and the monitored natural attenuation (MNA) alternative. MNA parameters will be collected from select monitoring wells. USEPA and Air Force Center for Environmental Excellence (AFCEE) guidance will be used to evaluate the newly acquired and existing groundwater sampling results.

MNA may be an appropriate remedial alternative if degradation of site contaminants is occurring at rates sufficient to be protective of human health and the environment. Three lines of evidence are commonly used to demonstrate that biodegradation is occurring at a site and to evaluate natural attenuation as a remedial alternative (Weidemeier *et al.* 1997):

- Documented loss of contaminants at the field scale (contaminant concentration trends),
- Contaminant and geochemical analytical data (natural attenuation indicators), and
- Microbiological evidence.

To show that the total contaminant mass at a site is decreasing, statistically significant temporal and spatial contaminant concentration trends will be evaluated in conjunction with parameters such as hydraulic conductivity, hydraulic gradient, and contaminant retardation factors. This first line of evidence will be used to evaluate natural attenuation in the areas of investigation.

To develop the second line of evidence, contaminant and electron acceptor concentration data (e.g., dissolved oxygen, ferrous iron/ferric iron, methane, sulfates, and nitrates) will be used to show that decreases in contaminant concentrations correlate with decreases in electron acceptor concentrations or increases in metabolic byproduct concentrations. This evidence can be used to estimate the biodegradation capacity of groundwater and thus confirm that electron acceptor concentrations are sufficient to allow microorganisms to degrade the dissolved contaminants. Geochemical data will also be used to identify the metabolic processes most likely to be responsible for observed biodegradation. This second line of evidence will be evaluated for monitored natural attenuation in the areas of investigation.

The third line of evidence, direct microbiological evidence, can be used to show that the indigenous population of microorganisms is capable of degrading site contaminants. However, because microcosm studies are expensive, time consuming, and yield biodegradation rates that may not reflect actual field conditions, they will not likely be evaluated for monitored natural attenuation at this site (Weidemeier *et al.* 1997).

7.3.3 No Further Action

This alternative is technically feasible because of the minimal requirements for implementation. No Further Action may be used as a remediation alternative only if site contamination naturally attenuates to acceptable levels. In some cases, No Further Action may be a temporary option if the short-term risks are determined to be low and more time is necessary for further investigation of other actions.

7.4 COMPARATIVE ANALYSIS/RECOMMENDED REMEDY

Upon completion of the detailed evaluation, a comparative analysis will be performed to aid in identifying and assessing relative strengths and weaknesses among the corrective measure alternatives. Detailed cost comparisons of each of the alternatives will also be presented in the FFS.

The recommended remedy for the groundwater soil remediation will be chosen and presented after completion of this comparative analysis.

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8.0 DATA ASSESSMENT, RECORDS, AND REPORTING REQUIREMENTS

The following sections describe the data assessment, recordkeeping, and reporting requirements for the IRA/FFS at the Schenectady ANGB in Scotia, New York.

8.1 DATA ASSESSMENT

Data collected during the course of the investigation will primarily consist of field and analytical data. Data assessment will vary based on type of data collected. All data will be analyzed to ensure that it is accurate and valid. Accurate, validated data will in turn be used to refine the conceptual site model and prepare technical reports.

Generating data of known quality begins in the planning stages when data quality objectives are established. The generation of usable data continues during sample collection and laboratory analysis by following the procedures put forth in the FSP and QAPP. Upon review of the field documentation, field procedures, and analytical data, data qualifiers will be assigned. Data qualifiers will be used to assess data validity and possible limitations on the usage of data when the established QA/QC criteria are not met.

Analytical data resulting from this investigation will be reviewed for chain-of-custody (CoC) documentation, summarized results, conformity with holding time restrictions, surrogate recoveries, field duplicate evaluation, and field and laboratory blank contamination. Data qualification will be based on the USEPA National Functional Guidelines for Organic Data Review (USEPA, 1999).

8.2 RECORDKEEPING

Field records will be maintained to recreate all sampling and measurement activities and to meet the data loading requirements of the Environmental Resources Program Information Management System (ERPIMS). The requirements put forth in this section apply to all measuring and sampling activities. Requirements that apply specifically to an individual activity are discussed in the section of the QAPP addressing the activity.

During the course of sampling/measurement activities, all information will be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages. These records will be archived and available to the ANG and NYSDEC upon request.

All entries into the logbook concerning field activities will contain the following information: (1) location, (2) date and time, (3) members of field crew conducting work, and (4) weather conditions. All entries into the logbook concerning field measurements will include the following additional information: (1) the numerical value and units of each measurement, and (2) the identity of and results from calibration of each field instrument.

All entries into the logbook concerning sampling activities will contain the following information: (1) sample type and sampling method, (2) the identity of each sample (includes sampling depth for soil samples), (3) the amount of material in each sample, (4) sample description (e.g. color, texture, clarity, odor), (5) identification of sampling devices, and (6) identification of conditions that might affect the representativeness of a sample.

In addition to the information recorded in the logbook, a number of forms will be completed during the course of sampling/measurement activities. The forms to be completed are: borehole logs, monitoring well sample collection forms, equipment calibration logs, groundwater level forms, CoCs, and subsurface clearance survey checklists.

Logbook and field form procedures are further discussed in the FSP.

8.3 REPORTING REQUIREMENTS

Upon the completion of field activities the following documents will be prepared as required by the Statement of Work:

- **IRA Report.** This report includes summary of all the field activities associated with the removal of debris and contaminated soil from Sites 3 and 6. The report will also contain all waste disposal manifest, confirmation sampling locations, and maps showing the limits of excavation. The IRA report will contain an introduction/background, site description, IRA field activities, IRA results, waste management, conclusion, and recommendations. Appendices will include at a minimum, screening results, analytical data, waste manifests, boring logs, and monitoring well construction logs.
- **Focused FS Report.** This report will present an assessment and evaluation of no less than two remedial alternatives. The FFS will be used to support the selection of a remedial action for Site 6 groundwater only. The FFS report will contain an introduction/background, environmental setting, pilot study program methods, pilot study results, residual risk assessment, development of alternatives, detailed analysis of alternatives, conclusion, and recommendations. Appendices will include at a minimum, analytical data, boring logs, monitoring well construction logs, and backup cost estimations.

9.0 PROJECT SCHEDULE

The proposed project schedule for the Schenectady IRA/FFS is provided in Figure 9-1. The project schedule includes the field activities, laboratory analysis, data management, and report preparation.

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FIGURES

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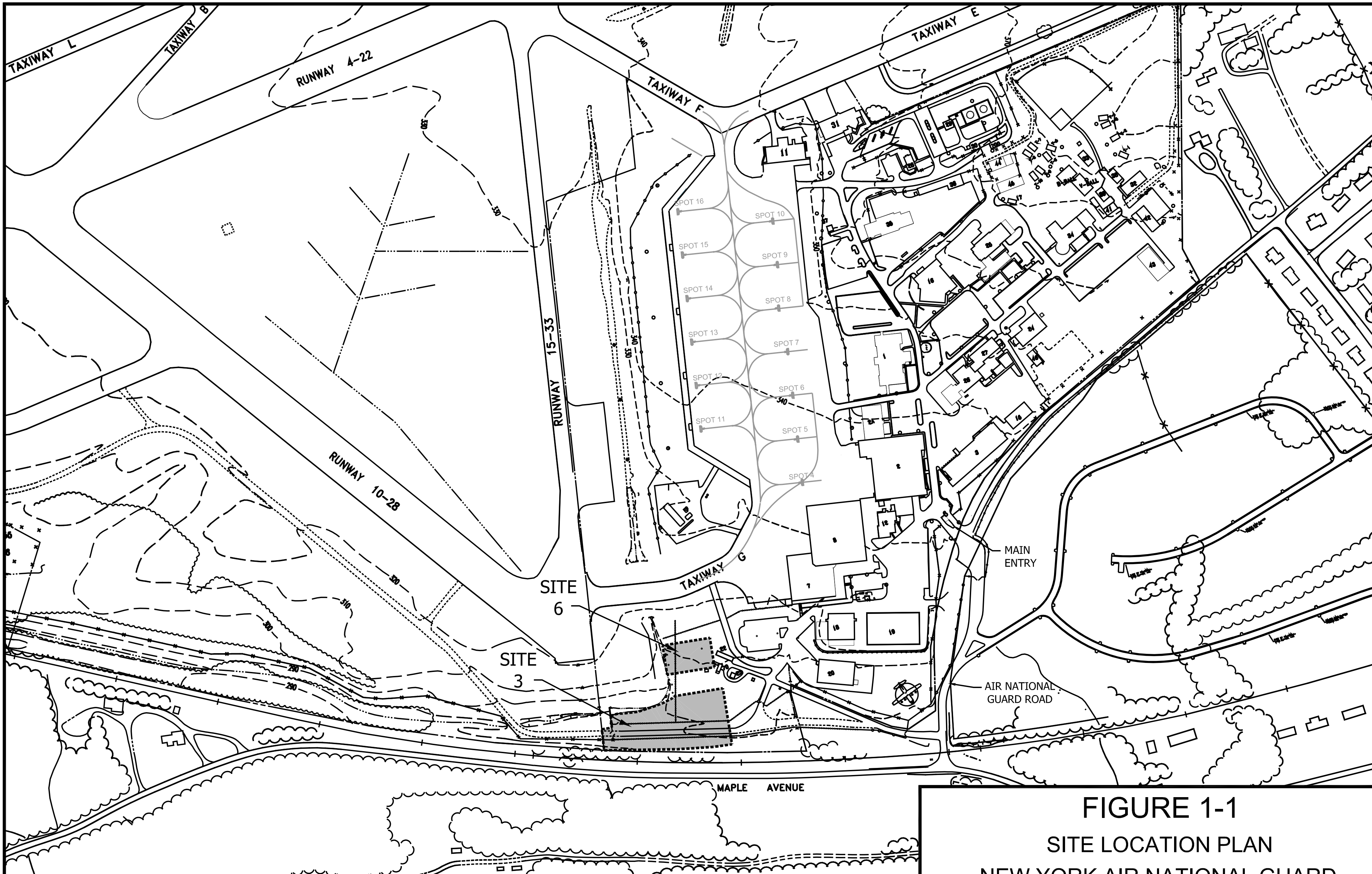


FIGURE 1-1

SITE LOCATION PLAN

NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

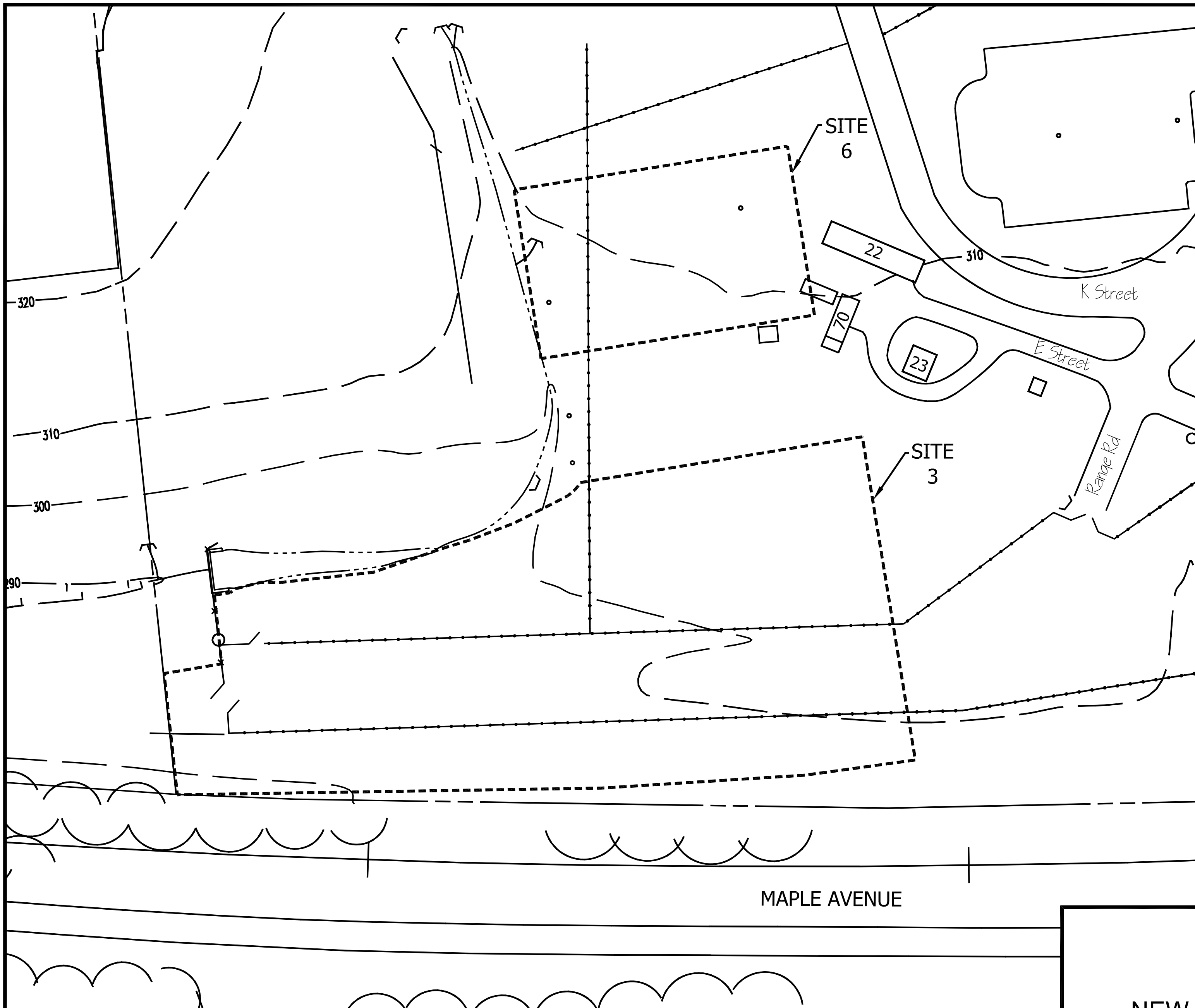
EarthTech
A tyco International Ltd. Company

MAP REFERENCE:

1. BASE MAPPING SHOWN SUPPLIED BY AIR NATIONAL GAURD.
2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

DATE: APRIL, 2007

PROJECT NO.: 96029



LEGEND

Fence

Creek

Building

Road

MAP REFERENCE:

1. BASE MAPPING SHOWN SUPPLIED BY AIR NATIONAL GAURD.
2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

PLAN

NORTH

Scale in Feet

0 50' 100'

FIGURE 1-2

SITE PLAN

NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

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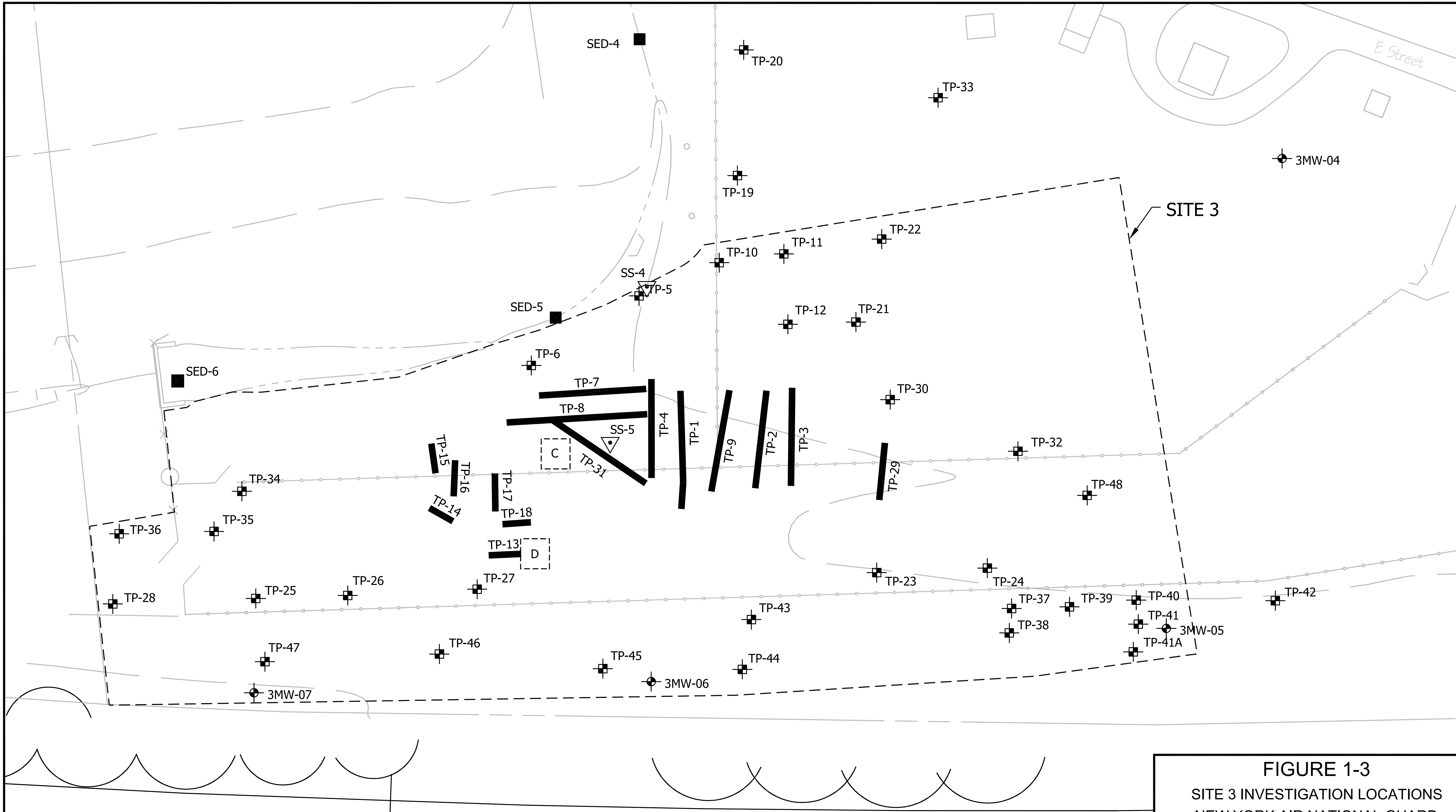
AIR NATIONAL GUARD

DATE: APRIL, 2007

PROJECT NO.: 96029



MAP REFERENCE:

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2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

NORTH

Scale in Feet

0 20' 40'

PLAN

LEGEND

SS-4 Soil Sample Location

SED-5 Sediment Sample Location

TP-6 Test pit Location

3MW-05 Monitoring Well Location

C Geophysical Anomaly

FIGURE 1-3

SITE 3 INVESTIGATION LOCATIONS

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109TH AIRLIFT WING

SCOTIA, NEW YORK

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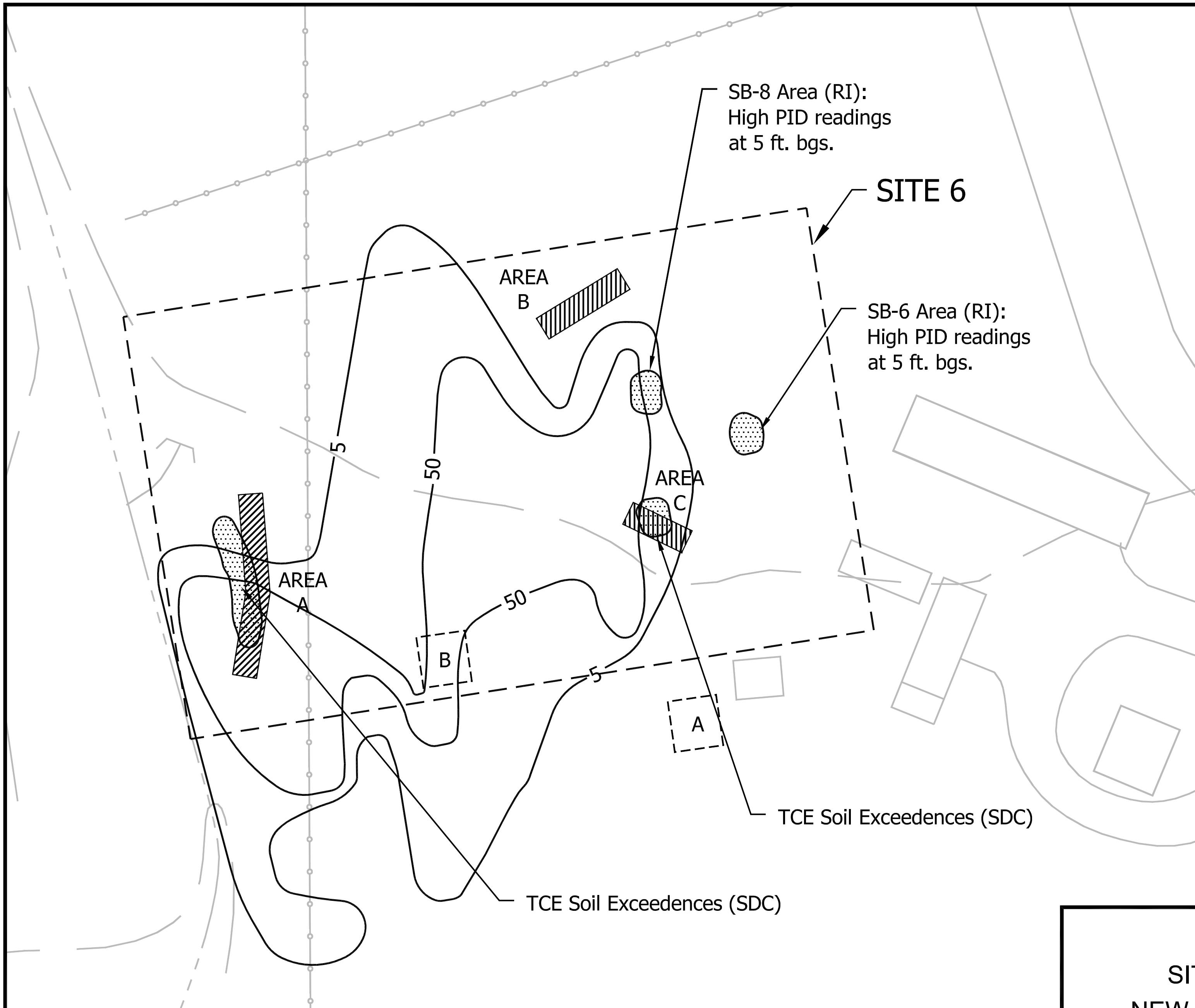

LEGEND

Areas of Excavation (2002 TCRA)

Extent of Soil Contamination

50 / 5 — Extent of VOC Groundwater Contamination in PPB (2002 SDC)

A — Geophysical Anomaly

RI — Remedial Investigation (1994)

SDC — Supplemental Data Collection (2002)

MAP REFERENCE:

1. BASE MAPPING SHOWN SUPPLIED BY AIR NATIONAL GAURD.
2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

PLAN

NORTH

Scale in Feet

0 20' 40'

FIGURE 1-4

SITE 6 AREAS OF CONCERN

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109TH AIRLIFT WING

SCOTIA, NEW YORK

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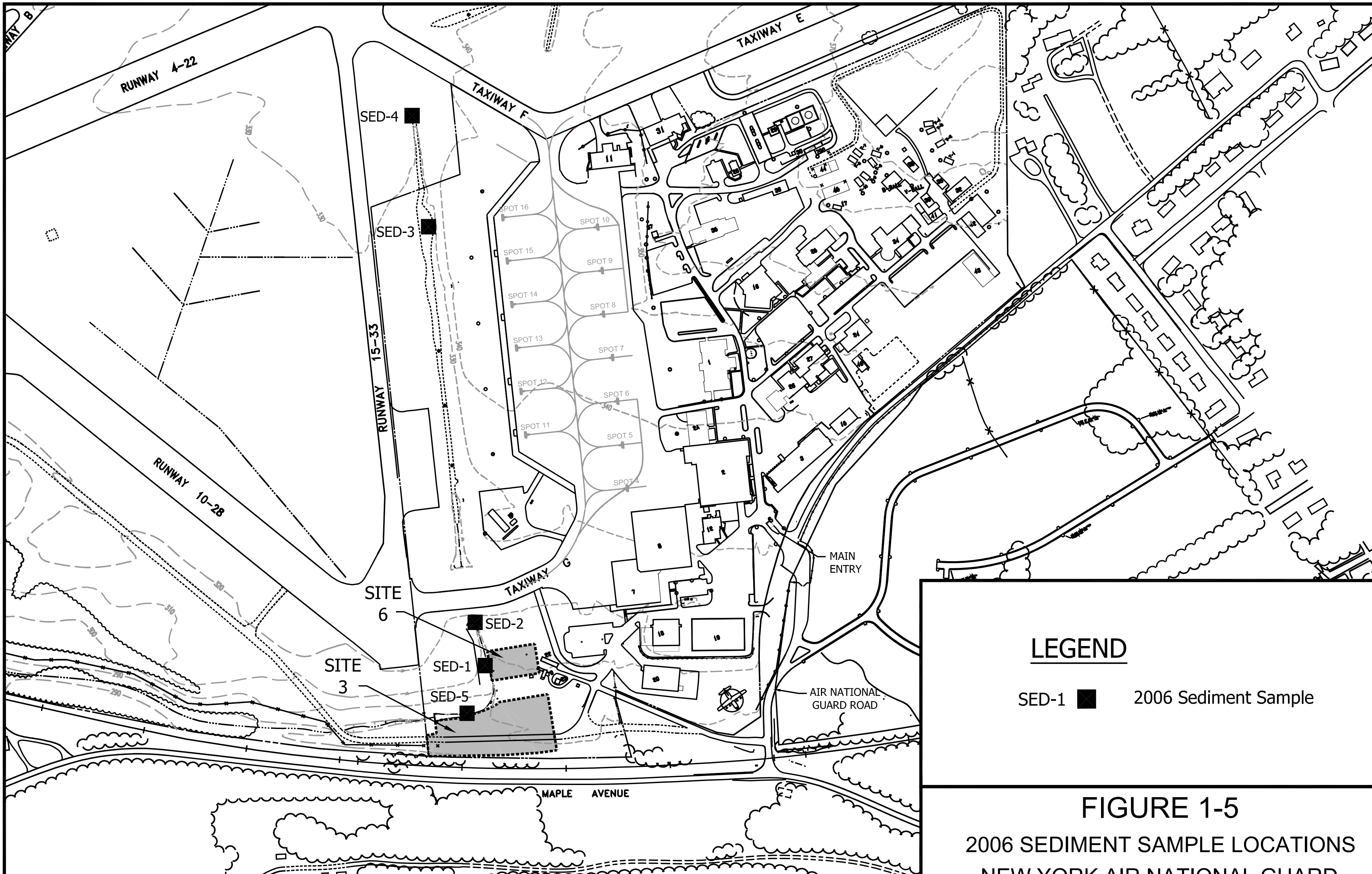

FIGURE 1-5

2006 SEDIMENT SAMPLE LOCATIONS
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SCOTIA, NEW YORK

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2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

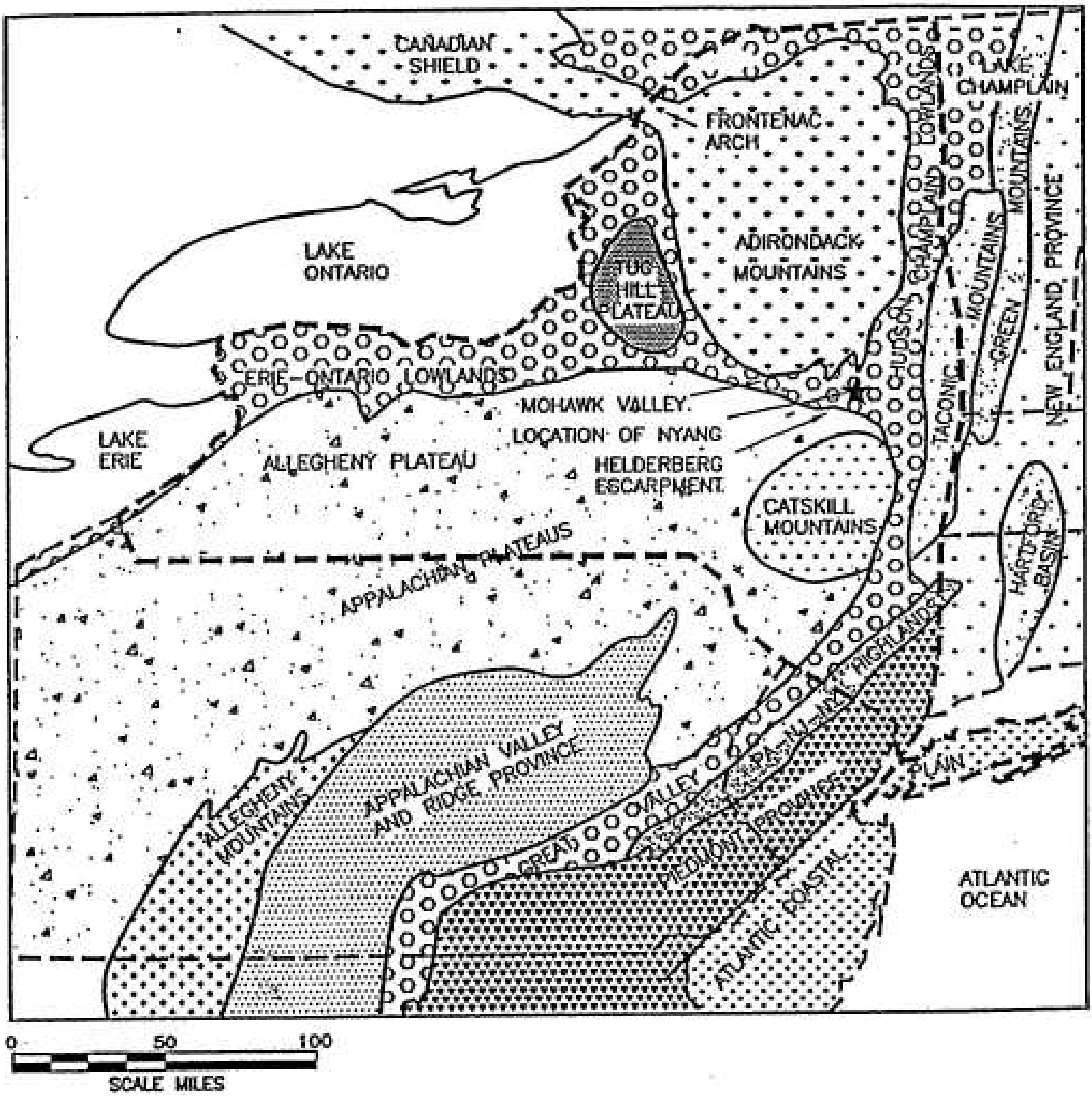
PLAN

NORTH

Scale in Feet
0 250' 500'

DATE: APRIL, 2007

PROJECT NO.: 96029



NOTE: SYMBOLS ARE PRESENT TO DIFFERENTIATE THE PHYSIOGRAPHIC REGIONS

SOURCE: ISACHEN ET AL. 1991

N
W E
S

New York Air National Guard Base
109th Airlift Wing
PHYSIOGRAPHIC MAP OF NEW YORK STATE
Scotia, New York

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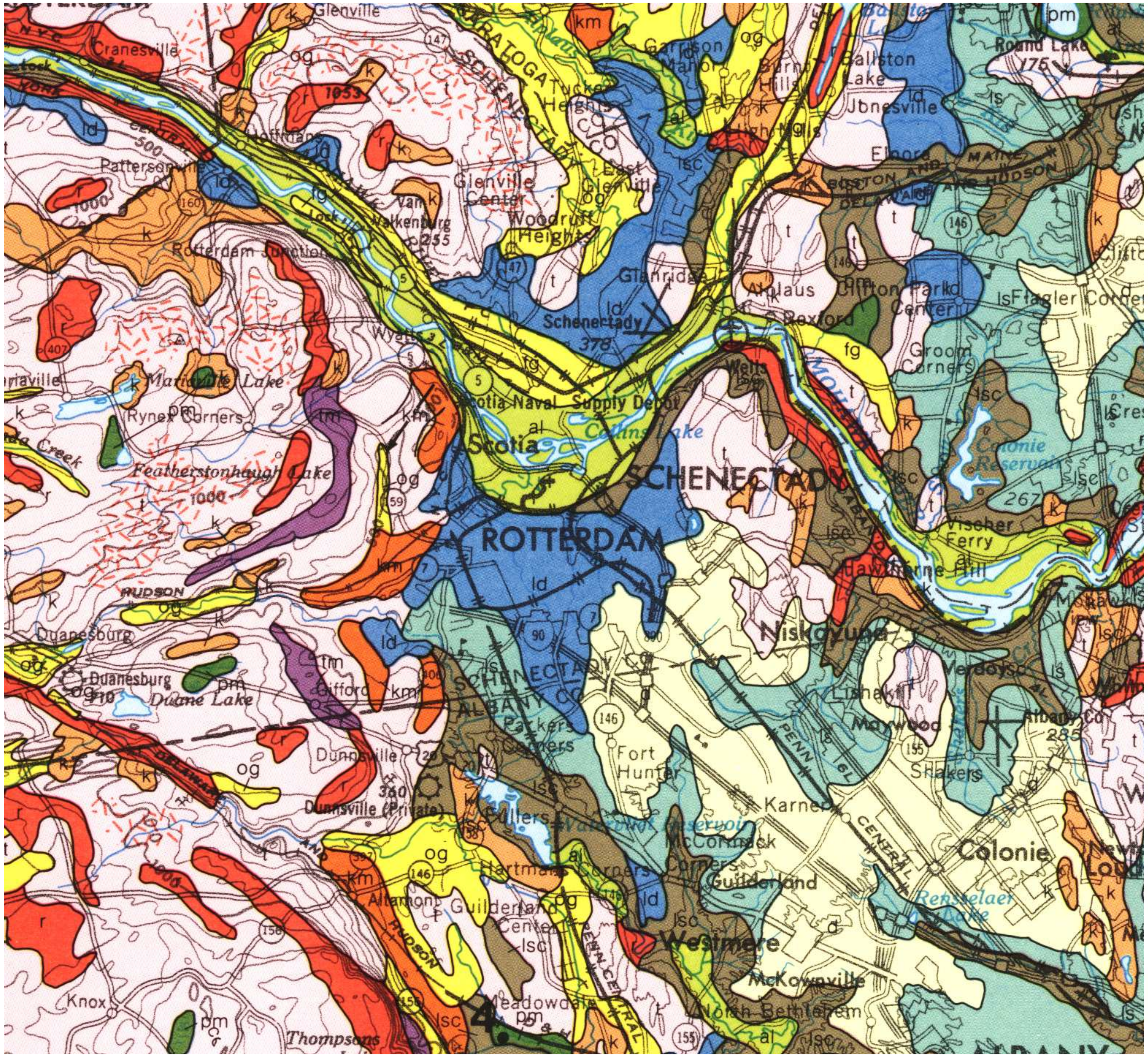
Figure 4-1



al — **Recent deposits**
Generally confined to floodplains within a valley, oxidized, non-calcareous, fine sand to gravel, in larger valleys may be overlain by silt, subject to frequent flooding, thickness 1-10 meters.

alf — **Alluvial fan**
Fan shaped accumulations, poorly stratified silt, sand and boulders, at the foot of steep slopes, generally permeable.

co — **Colluvium**
Mixture of sediments, deposited by mass wasting, thickness generally 1-5 meters.

cof — **Colluvial fan**
Fan shaped accumulation, mixture of sediments, at mouths of gullies, thickness generally 1-5 meters.

pm — **Swamp deposits**
Peat-muck, organic silt and sand in poorly drained areas, unoxidized, may be overlying marl and lake silts, potential land instability, thickness generally 2-20 meters.

d — **Dunes**
Fine to medium sands, well sorted, stratified, non-calcareous, unconsolidated, generally wind reworked lake sediments, permeable, well drained, thickness variable (1-10 meters).

lb — **Lacustrine beach**
Generally well sorted sand and gravel, stratified, permeable and well drained, deposited at a lake shoreline, generally non-calcareous, may have wave-winnowed lag gravel, thickness variable (1-5 meters).

ld — **Lacustrine delta**
Coarse to fine gravel and sand, stratified, generally well sorted, deposited at a lake shoreline, thickness variable (3-15 meters).

lsc — **Lacustrine silt and clay**
Generally laminated silt and clay, deposited in proglacial lakes, generally calcareous, potential land instability, thickness variable (up to 100 meters).

ls — **Lacustrine sand**
Sand deposits associated with large bodies of water, generally a near-shore deposit or near a sand source, well sorted, stratified, generally quartz sand, thickness variable (2-20 meters).

og — **Outwash sand and gravel**
Coarse to fine gravel with sand, proglacial fluvial deposition, well rounded and stratified, generally finer texture away from ice border, thickness variable (2-20 meters).

fg — **Fluvial gravel**
Same as outwash sand and gravel, except deposition farther from glacier, age uncertain.

fds — **Fluvial deltaic sand**
Generally fine sands, proglacial topset fluvial deposition, age uncertain, thickness variable (2-10 meters).

k — **Kame deposits**
Includes kames, eskers, kame terraces, kame deltas, coarse to fine gravel and/or sand, deposition adjacent to ice, lateral variability in sorting, coarseness and thickness, locally firmly cemented with calcareous cement, thickness variable (10-30 meters).

km — **Kame moraine**
Variable texture (size and sorting) from boulders to sand, deposition at an ice margin during deglaciation, locally cemented with calcareous cement, thickness variable (10-30 meters).

tm — **till moraine**
More variably sorted than till, generally more permeable than till, deposition adjacent to ice, more variably drained, may include ablation till, thickness variable (10-30 meters).

t — **till**
Variable texture (e.g. clay, silt-clay, boulder clay), usually poorly sorted diamict, deposition beneath glacier ice, relatively impermeable (loamy matrix), variable clast content — ranging from abundant well-rounded diverse lithologies in valley tills to relatively angular, more limited lithologies in upland tills, tends to be sandy in areas underlain by gneiss or sandstone, potential land instability on steep slopes, thickness variable (1-50 meters).

udc — **Undifferentiated drift complex**
Areas of undifferentiated glacial deposits, region may have complex stratigraphic relationships.

r — **Bedrock**
Exposed or generally within 1 meter of surface.

Bedrock stipple overprint
Bedrock may be within 1-3 meters of surface, may sporadically crop out, variable mantle of rock debris and glacial till.

MAP SYMBOLS

Contact

Glacial meltwater channel

2. Dated radiocarbon locality

N W E S

0 5 10

SCALE KILOMETERS

New York Air National Guard Base

109th Airlift Wing

SURFICIAL GEOLOGIC MAP OF NEW YORK STATE

Scotia, New York

Source: *Cadwell, D. H. and R. J. Dineen. Surficial geologic map of New York, Hudson-Mohawk Sheet, 1:250,000 series, 1987*

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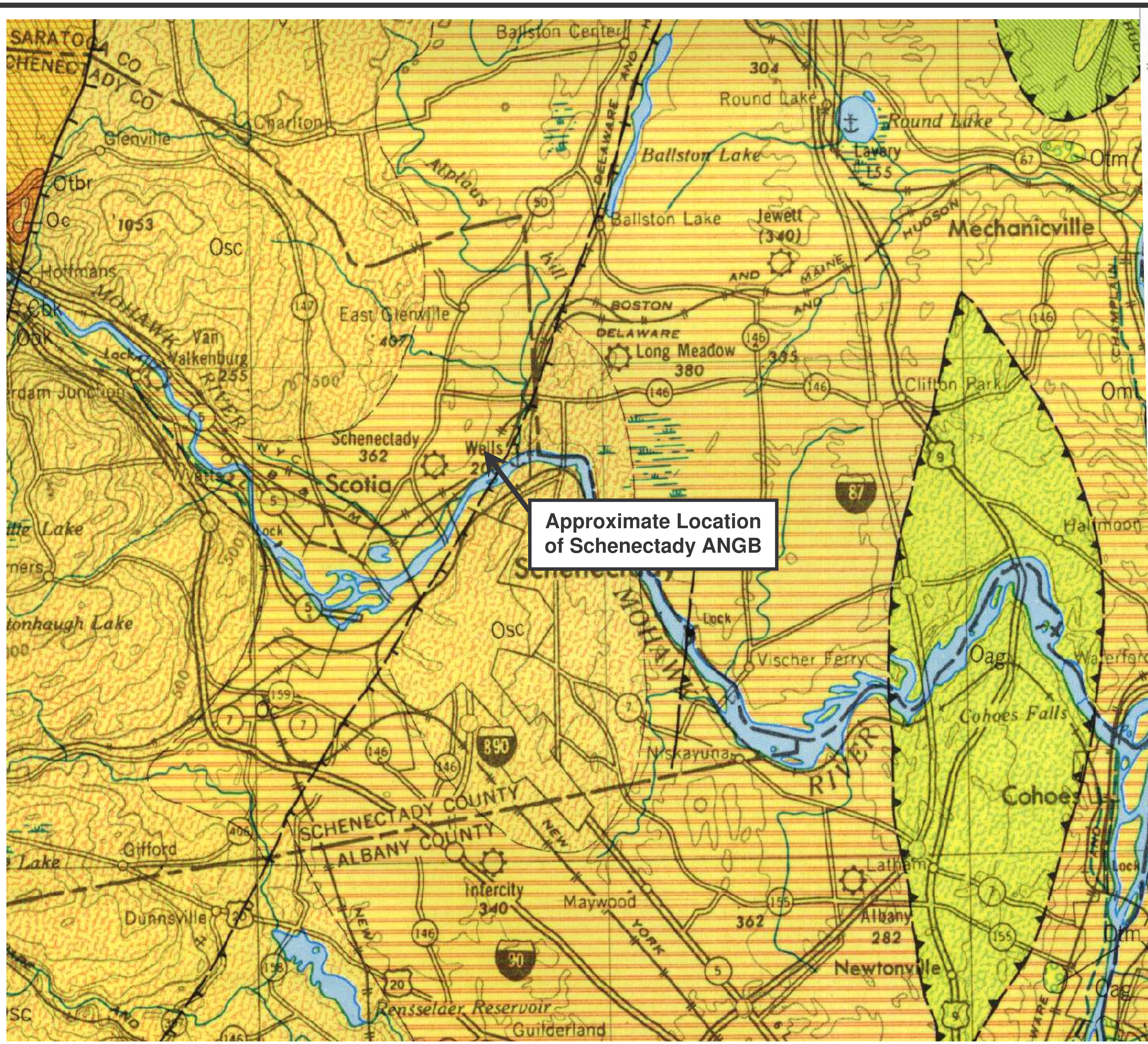
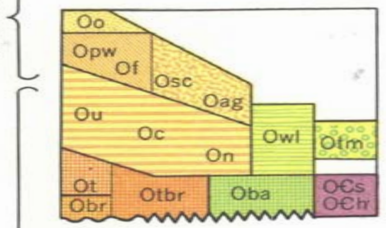
Figure 4-2

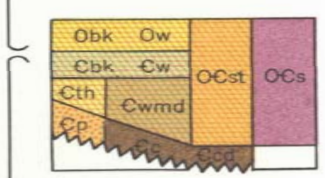




Upper Ordovician / Middle Ordovician

LORRAINE, TRENTON, AND BLACK RIVER GROUPS
up to 4,500 ft. (1400 m.)

- Oo — Oswego Sandstone
- Opw — Pulaski and Whetstone Gulf Formations—shale, siltstone.
- Of — Frankfort Formation—shale, siltstone.
- Osc — Schenectady Formation—graywacke, sandstone, siltstone, shale.
- Oag — Austin Glen Formation—graywacke, shale.
- Ou — Utica Shale.
- Oc — Canajoharie Shale.
- On — Normanskill Shale—minor mudstone, sandstone.
- Owl — Walloomsac Formation—slate, phyllite, schist, metagraywacke.
- Ot — Trenton Group. Denley, Sugar River, Kings Falls, and Rockland Limestones.
- Obr — Black River Group: Chaumont Limestone—chert; Lowville Limestone; Pamelia Dolostone.
- Otbr — Mohawk Valley: Trenton and Black River Groups—Dolgeville, Denley, Sugar River, Kings Falls, Glens Falls, Rockland, Amsterdam, and Lowville Limestones. Washington County: Glens Falls and Orwell Limestones.
- Oba — Balmville Limestone. Vermont: Whipple Limestone.
- Otm — Taconic Mélange—chaotic mixture of Early Cambrian thru Middle Ordovician pebble to block-size angular to rounded clasts in a pelitic matrix of Middle Ordovician (Barneveld) age. Rims and floors earlier submarine gravity slides of Taconian Orogeny.
- OЄs — Cambrian thru Middle Ordovician (Barneveld) carbonate rocks occurring as slivers caught along thrusts of later allochthones, or carbonate blocks in Taconic Mélange.
- OЄh — Horses along normal faults.



Lower Ordovician / Cambrian

BEEKMANTOWN AND STOCKBRIDGE GROUPS, POTSDAM SANDSTONE, AND VERMONT VALLEY SEQUENCE
up to 3,500 ft. (1100 m.)

- Obk — Beekmantown Group. Mohawk Valley: Chuctanunda Creek Dolostone; Tribes Hill Formation—limestone, dolostone; Gailor Dolostone. Washington County: Providence Island Dolostone; Fort Cassin Formation—limestone, dolostone; Fort Ann Formation—limestone, dolostone; Cutting Formation—dolostone, local chert, limestone at top, siltstone at base.
- Ow — Columbia County: Copake Formation—limestone, dolostone; Rochdale Limestone; Halcyon Lake Formation—chert, calc-dolostone.
- OЄst — Stockbridge Formation—calcitic and dolomitic marble.
- OЄs — slivers, as OЄs above.
- Єbk — Beekmantown Group. Mohawk Valley: Little Falls Dolostone—chert; Hoyt Formation—limestone, dolostone, oolite. Washington County: Whitehall Formation—dolostone, limestone; Ticonderoga Dolostone—chert.
- Єw — Columbia County: Briarcliff Dolostone; Pine Plains Formation—dolostone, oolite, shale.
- Єth — Theresa (Galway) Formation—dolostone, sandstone, shale.
- Єp — Potsdam Sandstone.
- Єwmd — Vermont: Winooski Dolostone, Monkton Quartzite, and Dunham (Rutland) Dolostone.
- Єc — Cheshire Quartzite.
- Єcd — Cheshire Quartzite and Dalton Formation.

N S W E

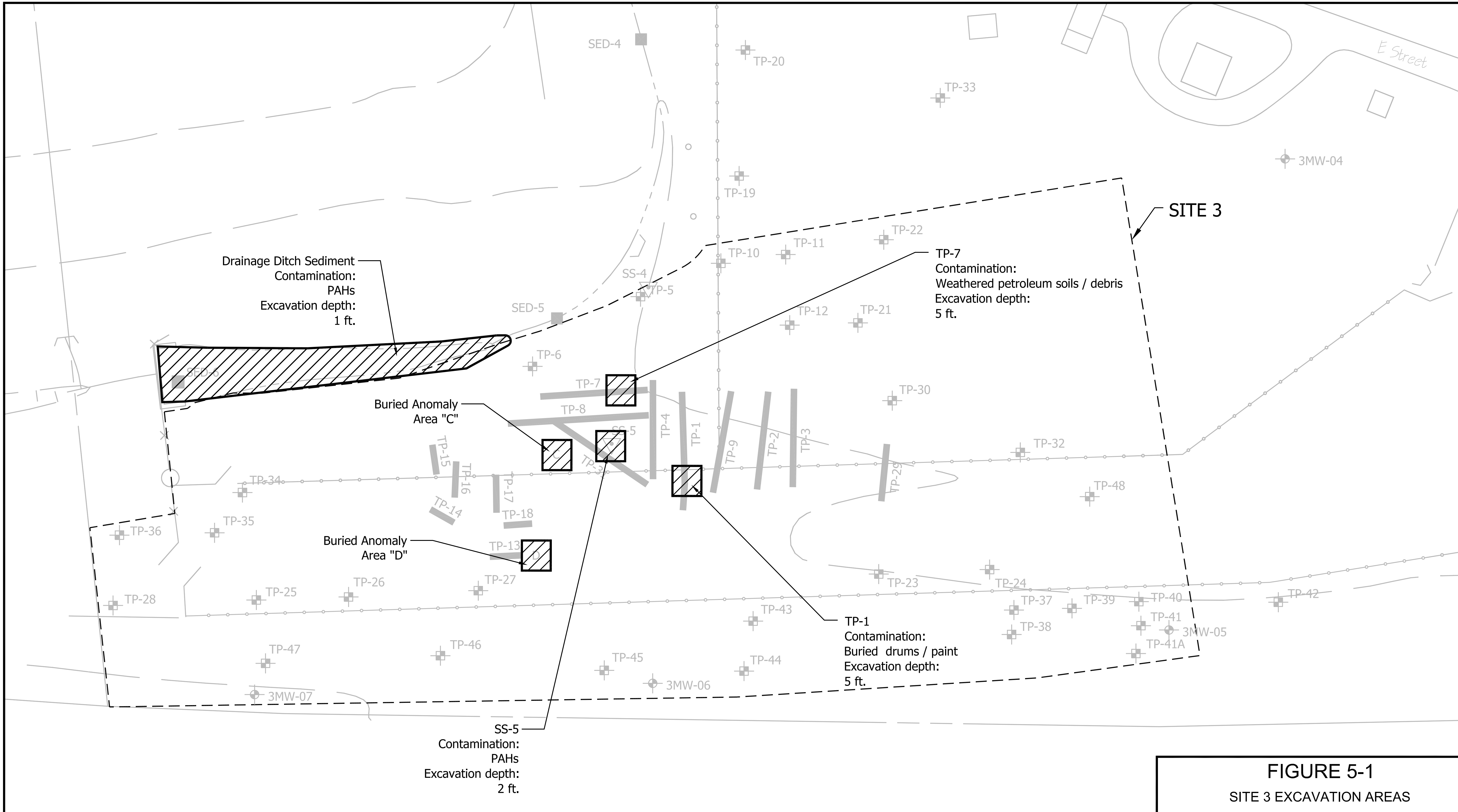
0 5 10
SCALE KILOMETERS

New York Air National Guard Base
109th Airlift Wing
BEDROCK GEOLOGIC MAP OF NEW YORK STATE
Scotia, New York

EarthTech
A tyco International Ltd. Company

Figure 4-3

Source: *D. W. Fisher; Y. W. Isachsen and L. V. Rickard, Geologic Map of New York State, Hudson-Mohawk sheet, 1970 (edited 1995)*



MAP REFERENCE:

1. BASE MAPPING SHOWN SUPPLIED BY AIR NATIONAL GAURD.
2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

NORTH

Scale in Feet

0 20' 40'

PLAN

LEGEND

Proposed Area of Excavation

FIGURE 5-1

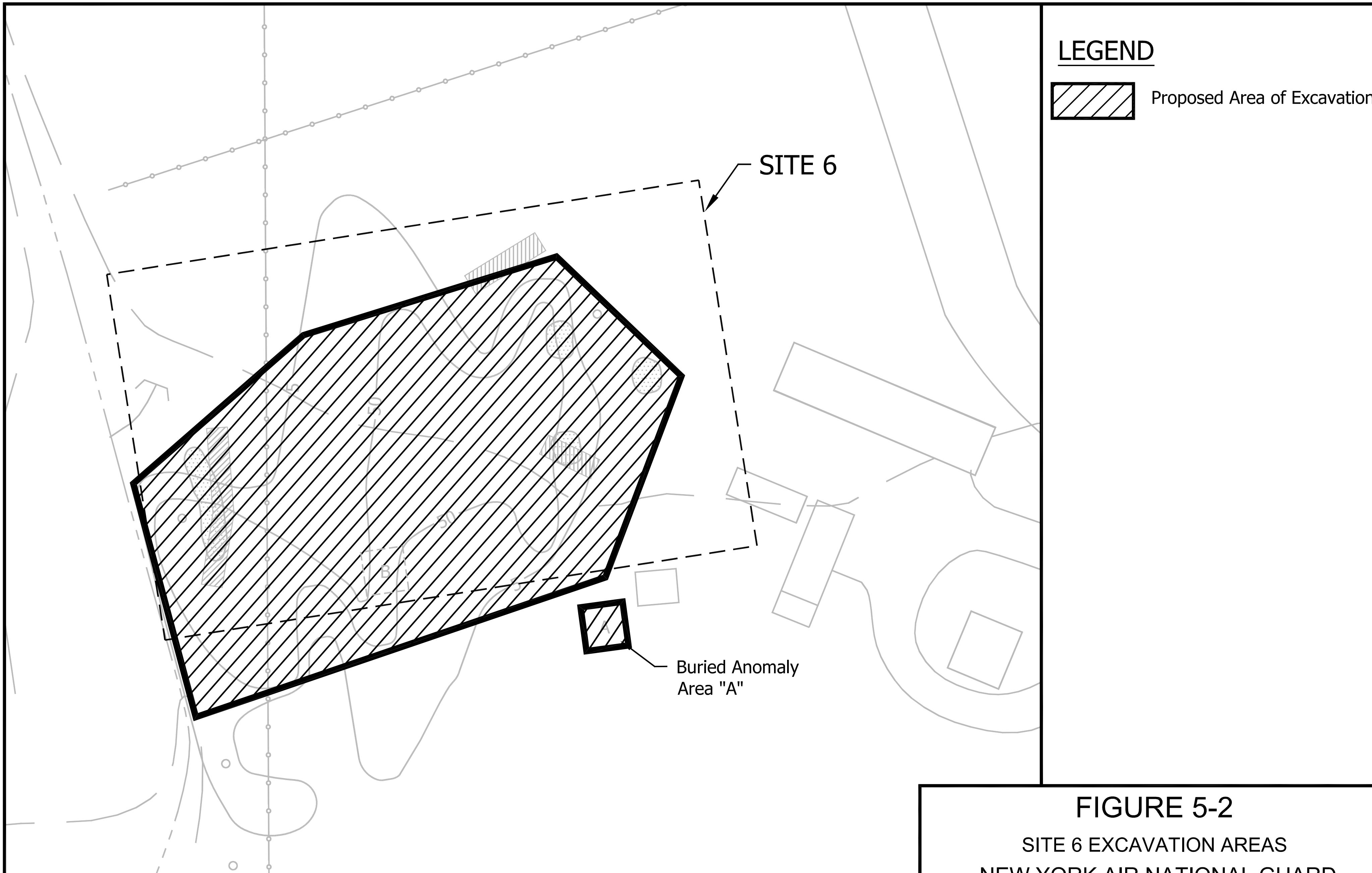
SITE 3 EXCAVATION AREAS

NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

EarthTech
A tyco International Ltd. Company

DATE: APRIL, 2007

PROJECT NO.: 96029



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2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

PLAN

NORTH

Scale in Feet

0 20' 40'

FIGURE 5-2

SITE 6 EXCAVATION AREAS

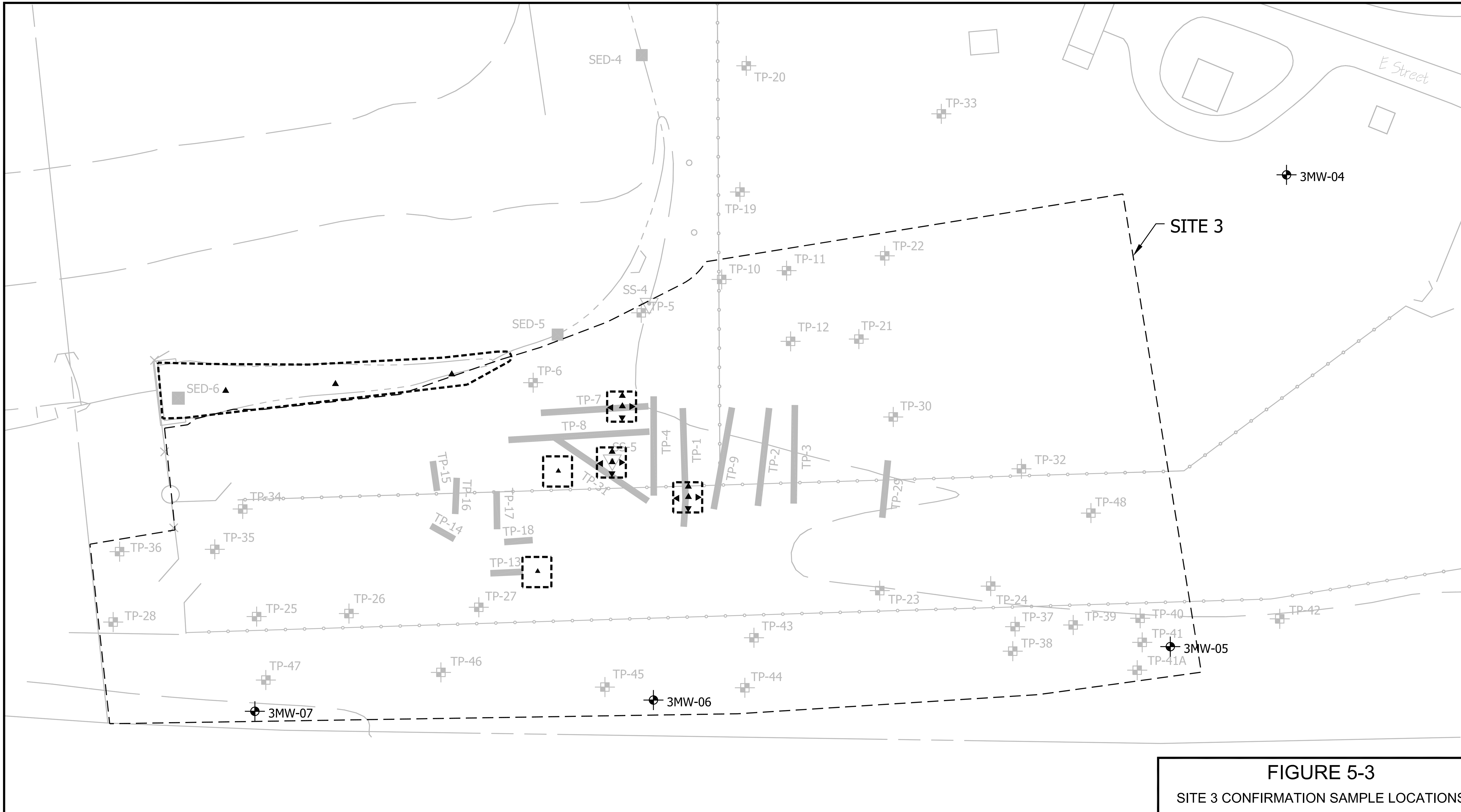
NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

EarthTech
A tyco International Ltd. Company

AIR NATIONAL GUARD

DATE: APRIL, 2007

PROJECT NO.: 96029



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2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

PLAN

LEGEND

Proposed Areas of Excavation

Confirmation Sample Location

FIGURE 5-3

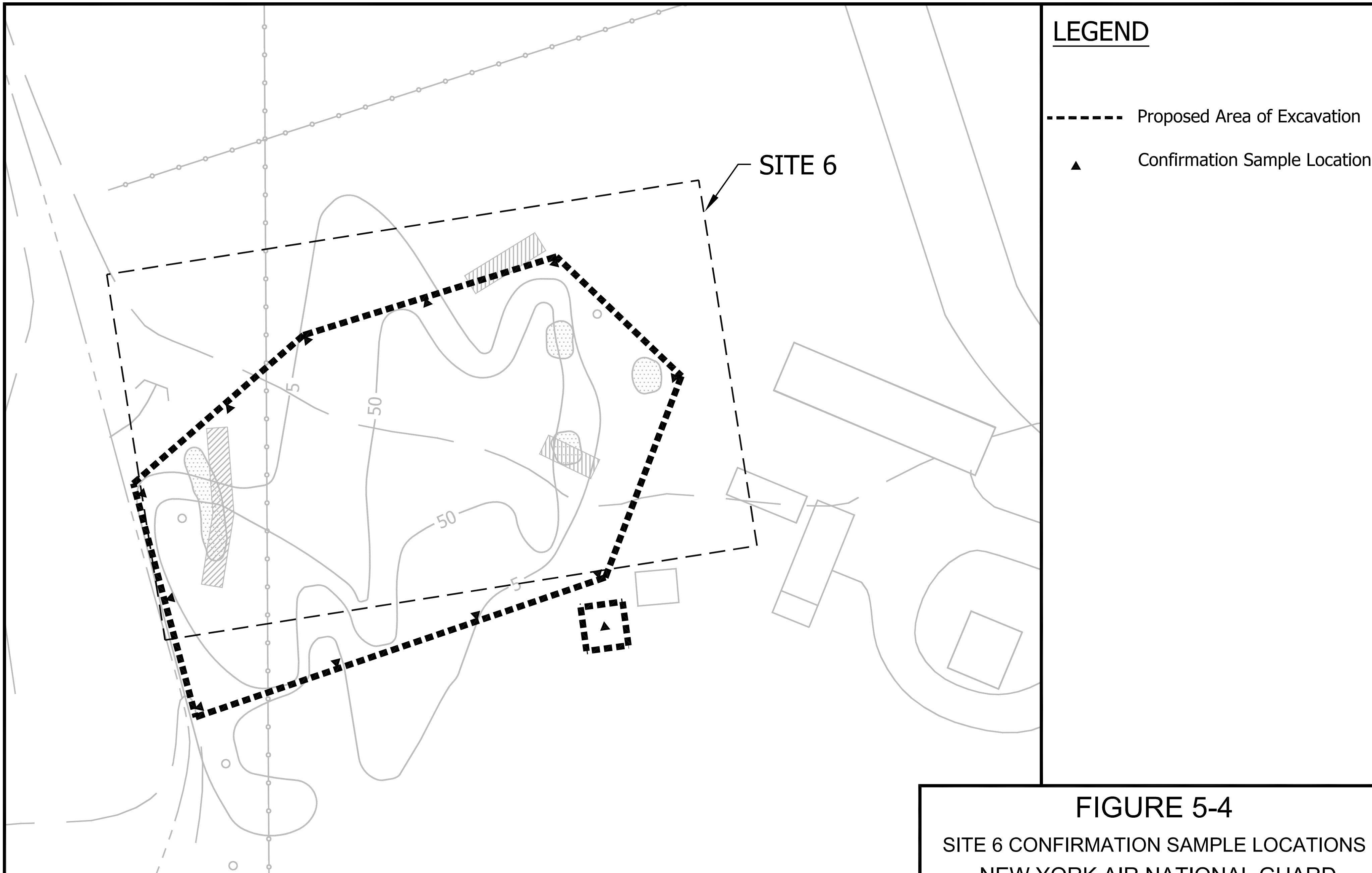
SITE 3 CONFIRMATION SAMPLE LOCATIONS

NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

EarthTech
A tyco International Ltd. Company

DATE: APRIL, 2007

PROJECT NO.: 96029



MAP REFERENCE:

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2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

PLAN

NORTH

Scale in Feet
0 20' 40'

FIGURE 5-4

SITE 6 CONFIRMATION SAMPLE LOCATIONS

NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

EarthTech
A tyco International Ltd. Company

DATE: APRIL, 2007

PROJECT NO.: 96029

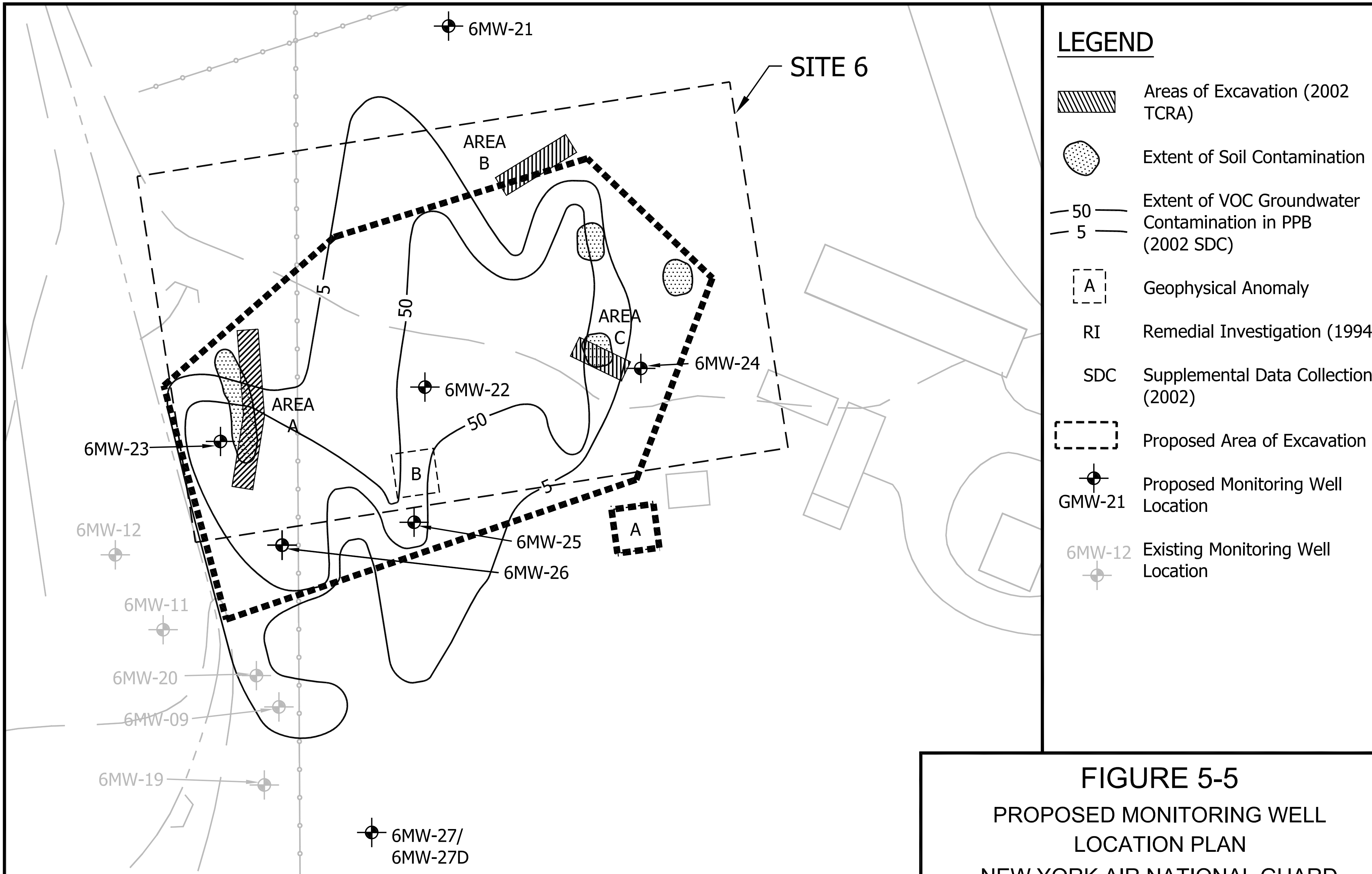


FIGURE 5-5

PROPOSED MONITORING WELL LOCATION PLAN

NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

EarthTech
A tyco International Ltd. Company

DATE: APRIL, 2007

PROJECT NO.: 96029

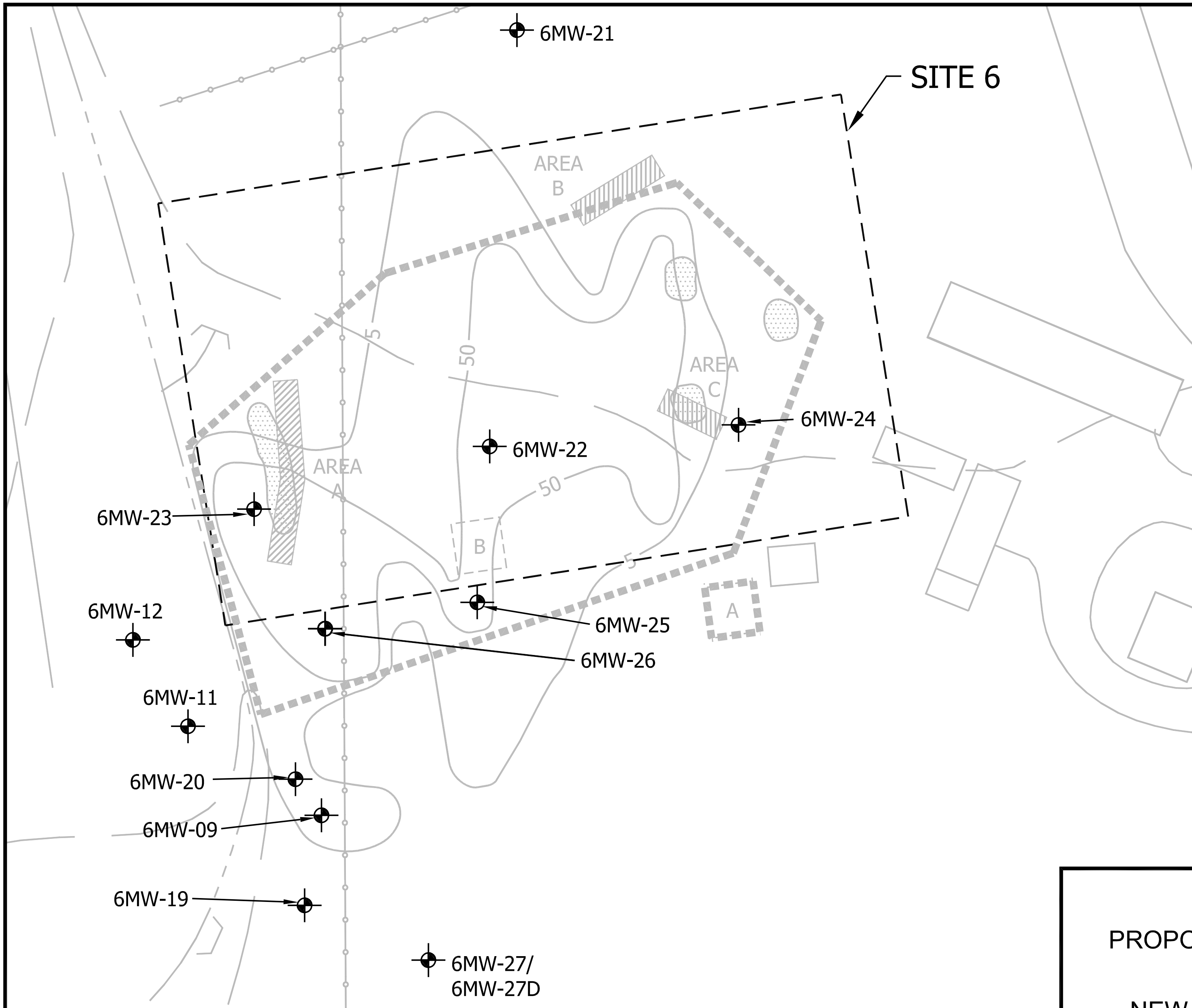
MAP REFERENCE:

1. BASE MAPPING SHOWN SUPPLIED BY AIR NATIONAL GAURD.
2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

PLAN

NORTH

Scale in Feet
0 20' 40'



LEGEND

GMW-21 Groundwater Sample Location

MAP REFERENCE:

1. BASE MAPPING SHOWN SUPPLIED BY AIR NATIONAL GAURD.
2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

PLAN

NORTH

Scale in Feet

0 20' 40'

FIGURE 5-6

PROPOSED GROUNDWATER SAMPLE LOCATION

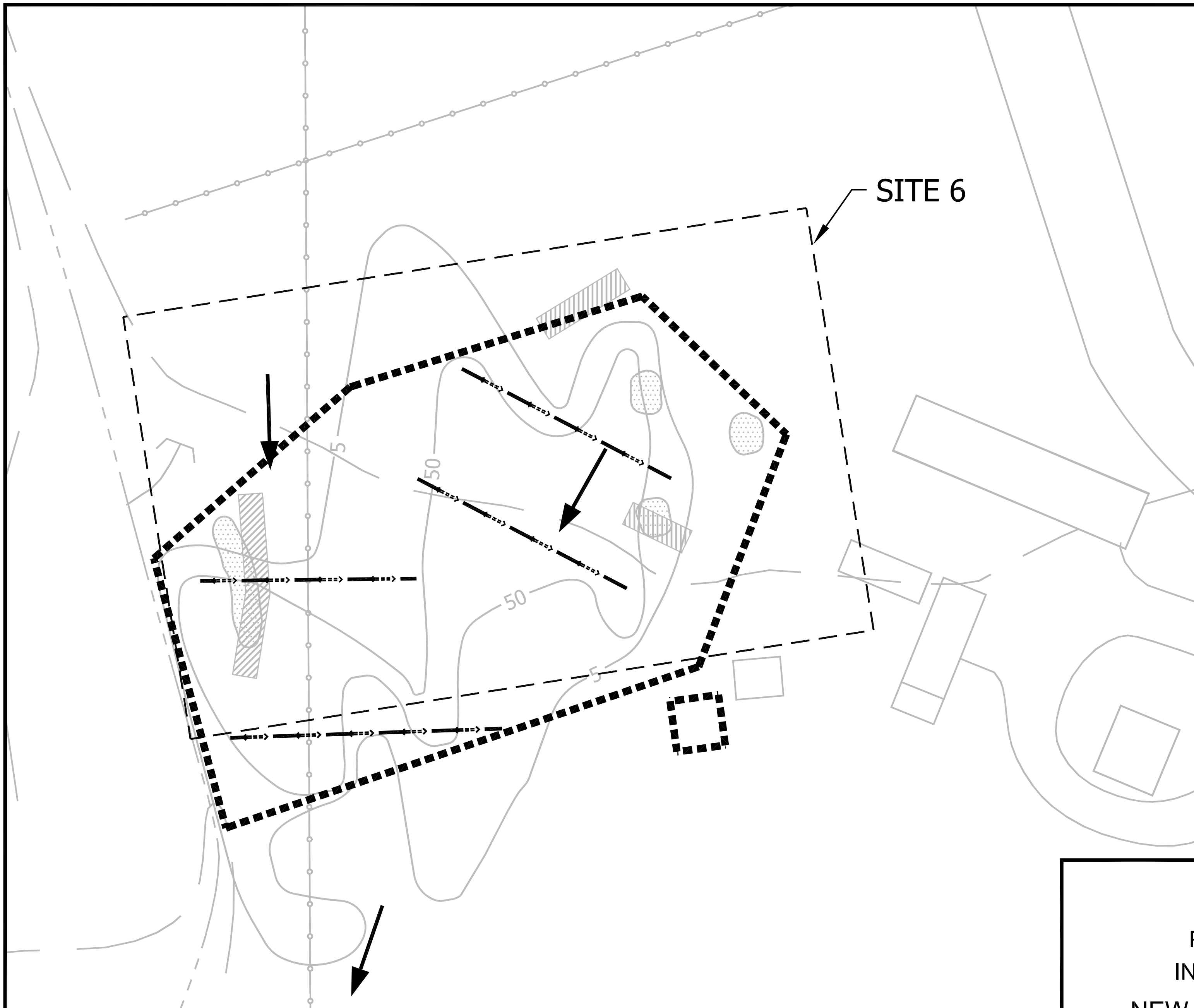
NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

EarthTech
A tyco International Ltd. Company

AIR NATIONAL GUARD

DATE: APRIL, 2007

PROJECT NO.: 96029



LEGEND

Approximate Groundwater Flow Direction (SDC 2002)

Horizontal Well Location for Enhanced Bioremeadiation Pilot Study

Proposed Area of Excavation above Chlorinated Hydrocarbon Groundwater Plume

MAP REFERENCE:

1. BASE MAPPING SHOWN SUPPLIED BY AIR NATIONAL GAURD.
2. PROPERTY LINES WHERE SHOWN ARE APPROXIMATE.
3. VERTIVCAL DATUM: ASSUMED
4. HORIZONTAL COORDINATE SYSTEM: STATE PLANE - EAST

PLAN

FIGURE 5-7

PROPOSED PILOT STUDY
INFUSION WELL LOCATIONS

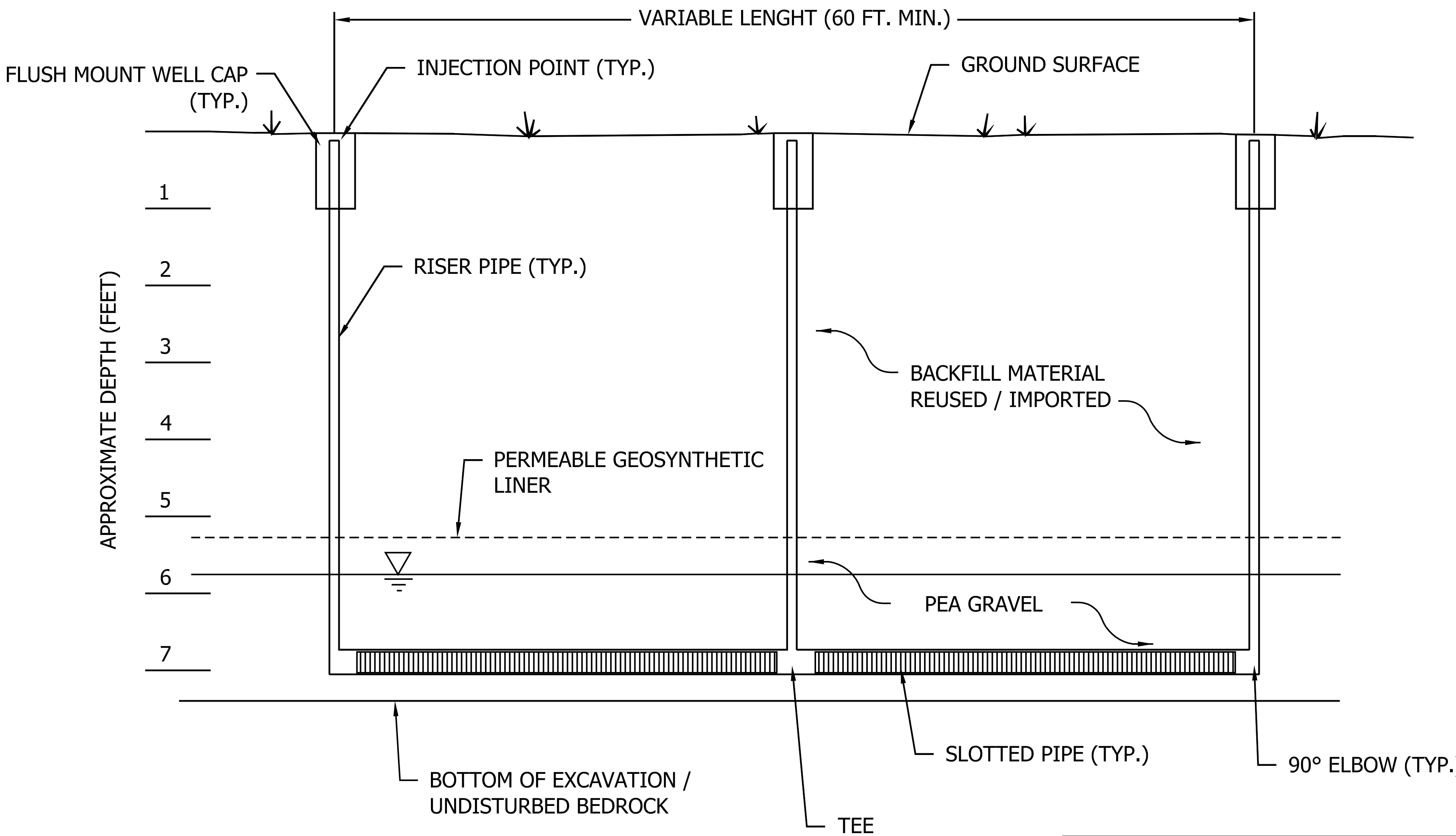
NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

EarthTech
A tyco International Ltd. Company

AIR NATIONAL GUARD

DATE: APRIL, 2007

PROJECT NO.: 96029



NOTES:

1. DEPTHS SHOWN ARE APPROXIMATE. WELL DEPTH WILL BE BASED ON ELEVATION OF COMPETENT BEDROCK.

2. HORIZONTAL WELL SHALL HAVE NO SLOPE.

3. ALL PIPE AND FITTINGS TO BE 4" DIA. SCH. 40 PVC

SECTION

NO SCALE

FIGURE 5-8

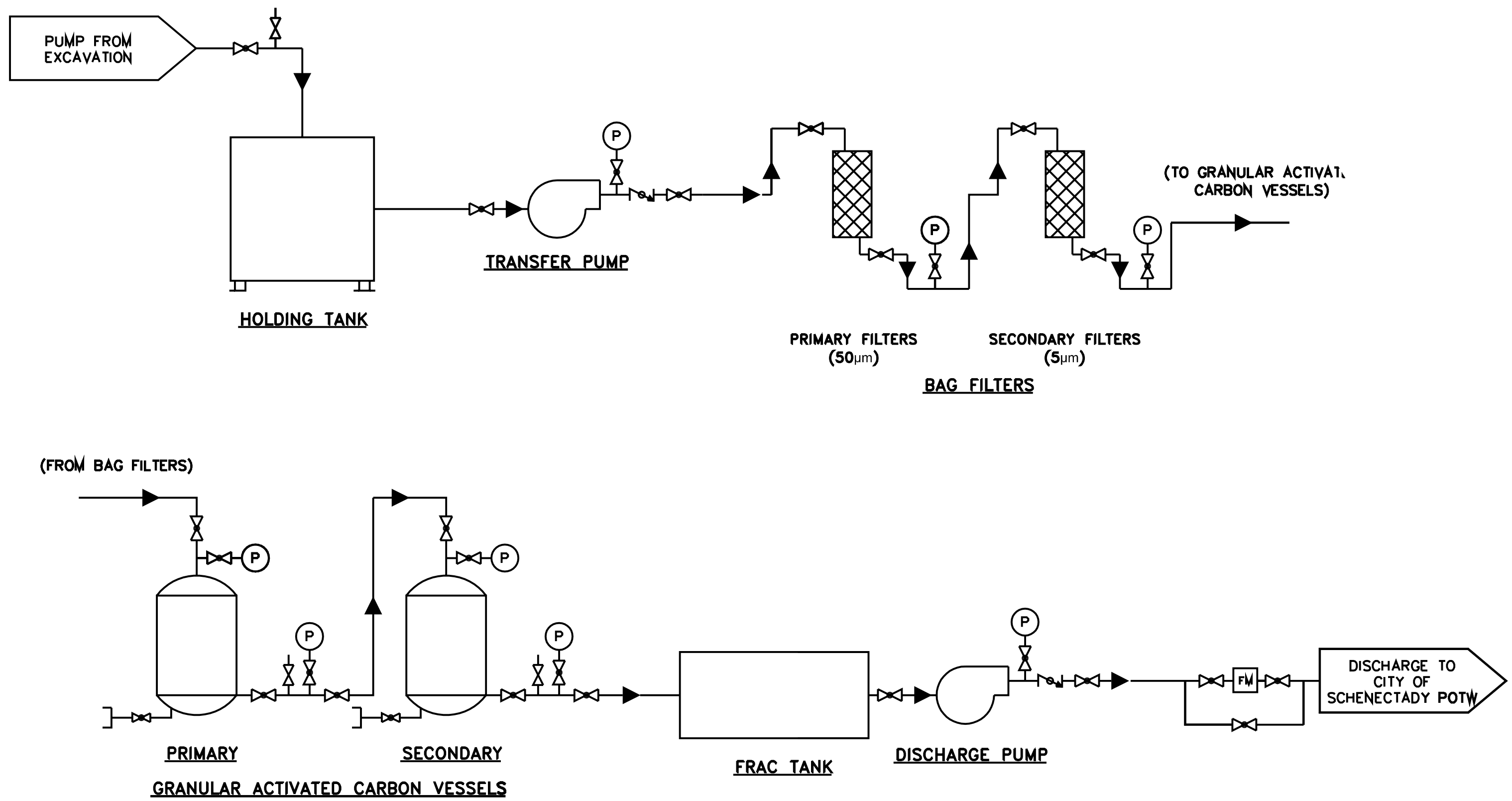
PROPOSED PILOT STUDY INFUSION WELL TYPICAL SECTION

NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

EarthTech
A tyco International Ltd. Company

DATE: APRIL, 2007

PROJECT NO.: 96029



LEGEND:

PRIMARY PROCESS PIPING

SECONDARY PROCESS PIPING

CENTR. CENTRIFUGAL PUMP

SAMPLE TAP

P PRESSURE GAUGE

BALL VALVE

CHECK VALVE

FM FLOW METER

LSH LEVEL SWITCH HIGH

LSHH LEVEL SWITCH HIGH–HIGH

LSL LEVEL SWITCH LOW

SECTION

NO SCALE

FIGURE 5-9

TEMPORARY GROUNDWATER TREATMENT P&ID

NEW YORK AIR NATIONAL GUARD
109TH AIRLIFT WING
SCOTIA, NEW YORK

EarthTech
A tyco International Ltd. Company

AIR NATIONAL GUARD

DATE: APRIL, 2007

PROJECT NO.: 96029

Project Schedule
Schenectady ANGB, New York

ID	Task Name	Duration	Start	Finish
1	**Quality Control Plan**	**45 days**	**Thu 8/31/06**	**Wed 11/1/06**
2	Develop WP	30 days	Thu 8/31/06	Wed 10/11/06
3	Submit Draft to ANG	10 days	Thu 10/12/06	Wed 10/25/06
4	Submit Final QCP to ANG	5 days	Thu 10/26/06	Wed 11/1/06
5	**IRA/FFS Work Plan**	**115 days**	**Thu 8/31/06**	**Wed 2/7/07**
6	Develop WP	45 days	Thu 8/31/06	Wed 11/1/06
7	Submit Draft WP to ANG	14 days	Thu 11/2/06	Tue 11/21/06
8	Revise WP	15 days	Wed 11/22/06	Tue 12/12/06
9	Submit Draft Final WP to ANG/NYSDEC	20 days	Wed 12/13/06	Tue 1/9/07
10	Revise WP	20 days	Wed 1/10/07	Tue 2/6/07
11	Submit Final WP to NYSDEC	1 day	Wed 2/7/07	Wed 2/7/07
12	**Interim Remedial Action Field Work**	**162 days**	**Thu 3/29/07**	**Fri 11/9/07**
13	Mobilization	5 days	Thu 3/29/07	Wed 4/4/07
14	Soil Removal	60 days	Thu 4/5/07	Wed 6/27/07
15	Discharge of Treated Excavation Groundwate	40 days	Thu 5/3/07	Wed 6/27/07
16	Install Horizontal Wells	3 days	Thu 6/28/07	Mon 7/2/07
17	Backfill	10 days	Tue 7/3/07	Mon 7/16/07
18	Site Restoration	2 days	Tue 7/17/07	Wed 7/18/07
19	Demobilization	1 day	Thu 7/19/07	Thu 7/19/07
20	Develop IRA Report	45 days	Fri 7/20/07	Thu 9/20/07
21	Submit Draft IRA Report to ANG	20 days	Fri 9/21/07	Thu 10/18/07
22	Revise IRA Report	15 days	Fri 10/19/07	Thu 11/8/07
23	Submit Final IRA Report to NYSDEC	1 day	Fri 11/9/07	Fri 11/9/07
24	**Groundwater Investigation/Pilot Study**	**202 days**	**Thu 4/5/07**	**Fri 1/11/08**
25	Install New Overburden/Bedrock Monitoring \	10 days	Thu 6/28/07	Wed 7/11/07
26	Develop Wells	5 days	Thu 7/12/07	Wed 7/18/07
27	Baseline Sampling	4 days	Thu 4/5/07	Tue 4/10/07
28	Infuse Substrate into Groundwater	3 days	Thu 6/28/07	Mon 7/2/07
29	Sample Round 1	4 days	Thu 8/9/07	Tue 8/14/07
30	Sample Round 2	4 days	Wed 10/10/07	Mon 10/15/07
31	Sample Round 3	4 days	Tue 1/8/08	Fri 1/11/08
32	**Mid Project Performance Meeting**	**2 days**	**Mon 10/1/07**	**Tue 10/2/07**
33	**Focused Feasibility Study**	**121 days**	**Mon 12/3/07**	**Mon 5/19/08**
34	Develop FFS	60 days	Mon 12/3/07	Fri 2/22/08
35	Submit Draft FFS to ANG	20 days	Mon 2/25/08	Fri 3/21/08
36	Revise FFS	10 days	Mon 3/24/08	Fri 4/4/08
37	Submit Draft Final FFS to ANG/NYSDEC	20 days	Mon 4/7/08	Fri 5/2/08
38	Revise FFS	10 days	Mon 5/5/08	Fri 5/16/08
39	Submit Final FFS to NYSDEC	1 day	Mon 5/19/08	Mon 5/19/08
40	**Project Plan/Record of Decision**	**41 days**	**Tue 7/1/08**	**Tue 8/26/08**
41	Develop PP/ROD	20 days	Tue 7/1/08	Mon 7/28/08
42	Submit Draft PP/ROD to ANG	20 days	Tue 7/29/08	Mon 8/25/08
43	Submit Draft Final PP/ROD to ANG/NYSDEC	1 day	Tue 8/26/08	Tue 8/26/08
44	**Project Period of Performance Ends**	**0 days**	**Fri 8/29/08**	**Fri 8/29/08**

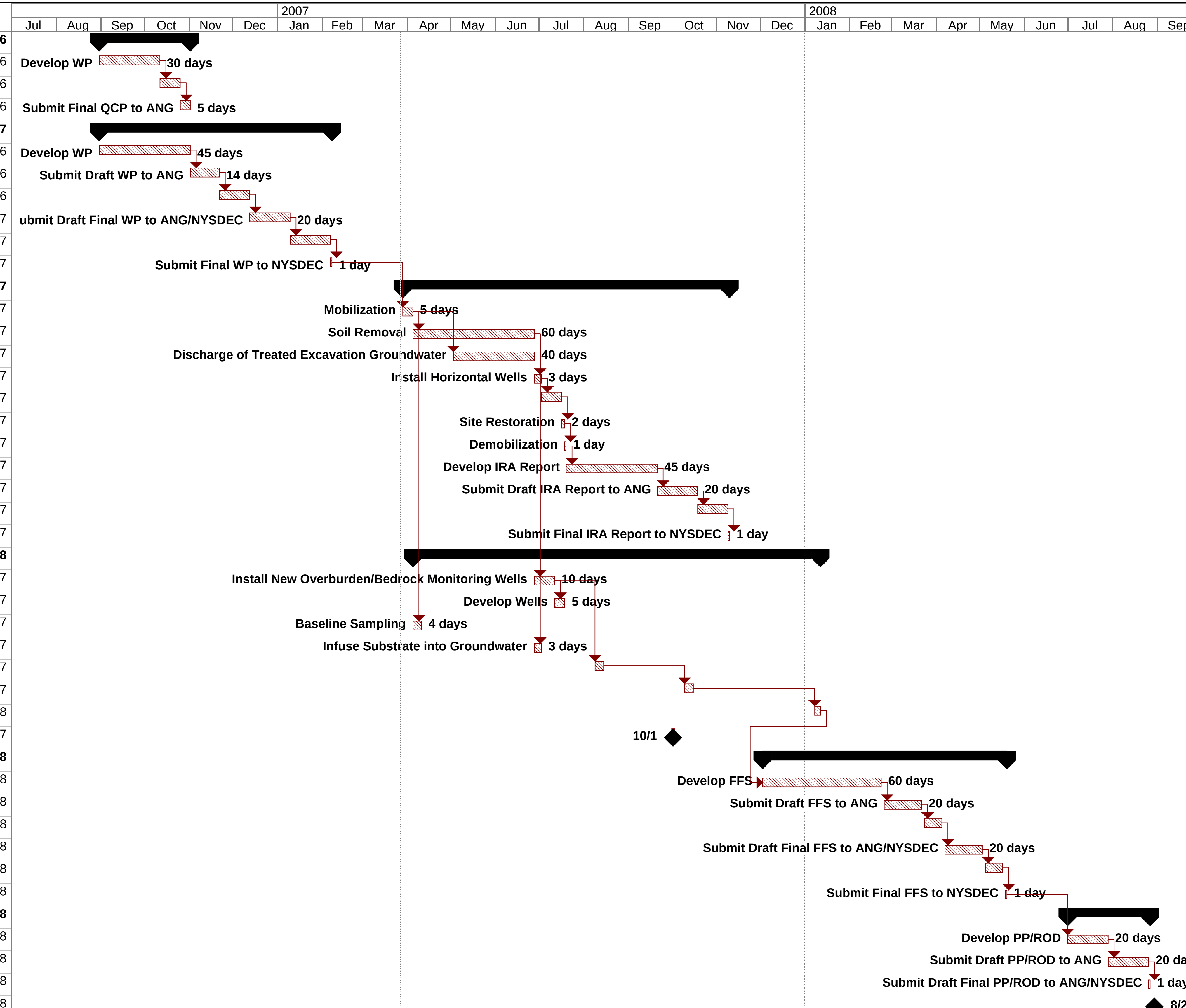


FIGURE 9-1
Project: Schenectady ANGB IRM/FFS
Date: Tue 3/27/07

Task	Progress	Summary	External Tasks	Deadline
Split	Milestone	Project Summary	External Milestone	

APPENDIX A
Health and Safety Plan

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FINAL
HEALTH AND SAFETY PLAN

New York Air National Guard
Schenectady Air National Guard Base
1 Air National Guard Road
Scotia, New York 12302

Prepared for:

Air National Guard Headquarters
3500 Fetchet Avenue
Andrews Air Force Base, Maryland 20762-5157

Prepared by:

Earth Tech, Inc.
40 British American Boulevard
Latham, New York 12110

April 2007

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 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.

Prepared by:

March 27, 2007

Lucas J. Benedict — Date
Geologist

Approved by:

March 27, 2007

Robert M. Poll, CIH, CSP — Date
District Safety Manager

Scott Underhill

March 27, 2007

Scott A. Underhill, PE — Date
Project Manager

TABLE OF CONTENTS

SECTION **PAGE**

ATTACHMENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ANG	Air National Guard
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of Concern
CoC	Chain-of-Custody
COPC	Chemical of Potential Concern
CRZ	Contaminant Reduction Zone
CVOC	Chlorinated Volatile Organic Carbon
DCE	Dichloroethene
DO	Dissolved Oxygen
DoD	Department of Defense
EQuIS	Environmental Quality Information System
°F	degrees Fahrenheit
FID	Flame Ionization Detector
FFS	Focused Feasibility Study
FS	Feasibility Study
FSP	Field Sampling Plan
HASP	Health and Safety Plan
HSA	Hollow Stem Auger
HSCA	Hazardous Substances Control Act
ID	Inner Diameter
IRA	Interim Remedial Action
IRP	Installation Restoration Program
LNAPL	Light Non-aqueous Phase Liquid
MCL	Maximum Contaminant Level
MDC	Maximum Detected Concentration
MDL	Method Detection Limit
ug/L	Micrograms per Liter
MNA	Monitored Natural Attenuation
MSDS	Material Safety Data Sheet
NCP	National Contingency Plan
NYSDEC	New York Department of Environmental Conservation

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

NYSDOH	New York Department of Health
OD	Outer Diameter
OU	Operable Unit
PA	Preliminary Assessment
PAH	Polyaromatic Hydrocarbon
PCE	Tetrachloroethene
PEF	Particulate Emissions Factor
PID	Photoionization Detector
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SDWA	Safe Drinking Water Act
SI	Site Investigation
SH&E	Safety, Health and Environmental Manual for Environmental Practices
SSALs	Site Specific Action Levels
SSO	Site Safety Officer
SVOC	Semi-volatile Organic Compound
SOW	Scope of Work
TCA	Trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbons
US	United States
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

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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 at the site, located at 1 Air National Guard Road in Scotia, 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. Once generated, each Supplement will be inserted in Attachment E and reviewed/acknowledged by field personnel prior to the start of applicable work activities.

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 Safety, Health & Environmental Manual for Environmental Practices (SH&Es) 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 SH&Es. In the event of a conflict between this HASP, the SH&Es, 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 of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. At Earth Tech, we believe 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 Earth Tech Corporate Policy SH&E 001, *Safety, Health and Environmental Policy Statement*.

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 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 *Environmental Practice Operations Safety 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
- 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 is located at the following web address:

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

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 site. Work will be performed in accordance with the applicable Statement of Work (SOW) and associated Work Plans developed. Deviations from the listed SOW 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 site, 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

This section provides a general description and historical information associated with the site.

2.1.1 Site Description/History

The Schenectady Air National Guard site is located at 1 Air National Guard Road (see Figure 2-1 at the end of this section). The Schenectady ANGB is located in the southeast portion of Schenectady County Airport in Scotia, New York. The Base covers an area of roughly 106 acres. The airport is located approximately 2 miles northeast of Scotia, NY. The location of the Base is shown in Figure 4-1. The land located to the north, east, and west is residential and agricultural. South of the Base is the Mohawk River, a railway, and commercial and residential properties. Prior to the construction of the Base, the property was used for agricultural purposes.

In November of 1949, the Air National Guard authorized the formation of the 139th fighter squadron of the New York National Guard. This unit was previously located at the Scotia Naval Depot, which is approximately three miles west of the Base. By September of 1950, the permanent facilities for the unit were completed at the SCA and consisted of the present administration building, hanger, vehicle maintenance and various supply buildings.

Since then, the Base has operated an array of military aircraft under numerous assignments. These have included the B-6, C-47, the C-97A and C-97G Stratocrusiers, various models of the C-130 Hercules, F-94 Starfire jets, P-47 Thunderbolt, P-51 Mustang, and the T-6. In 1991 the unit was redesignated to the 109th Airlift Wing and has since continued operations of the C-130H Aircraft.

2.1.2 Previous Investigations

This section summarizes previous investigations and remedial actions at the Schenectady ANGB. These investigations included a Preliminary Assessment (PA), Site Investigation (SI), RI, a Supplemental Data Collection (SDC) sampling program, and a Feasibility Study (FS) for Site 6. The only remedial action conducted at Site 6 has been a Time Critical Removal Action (TCRA).

2.1.2.1 Preliminary Assessment

A PA was performed at the Base by the U.S. Air Force Hazardous Material Technology Center (HMTC) in 1988. The PA included site visits, a review of existing environmental information, analysis of the Base records concerning the use and generation of hazardous materials/wastes,

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Figure 2-1
Site Map

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and Base personnel interviews. The PA identified two AOCs: Site 1, Former Fire Training Area; and Site 2, Former Drum Storage Area.

In April of 1990, a construction crew performing routine repairs to a gravel road located adjacent to the Base sewage treatment plant unearthed four metal drums. The drums, their contents and a small amount of soil were removed and the area was restored to its original grade. Additional materials were suspected to have been buried in this location. Therefore, this area was identified as Site 3 and included in the investigations conducted at the Base.

2.1.2.2 Site Investigation

An SI was completed at the Base in 1996 by ABB Environmental Services. This investigation included Sites 1, 2, and 3. The SI included geophysical surveys, installation of groundwater monitoring wells, collection and analysis of surface soil and sediment samples, collection and analysis of surface water and groundwater samples, and aquifer testing. In the SI report, delisting of Sites 1 and 2 were recommended along with further investigation of Site 3. The NYSDEC concurred with the recommendations for Sites 1 and 3, but required further investigation of Site 2.

2.1.2.3 Remedial Investigation

In June of 1999, an RI was completed at the Base (ANEPTEK, 2000). The RI initially included Sites 2 and 3. The RI included installation of groundwater monitoring wells, aquifer testing, and two rounds of groundwater sampling. The investigation at Site 3 also included the collection of soil and sediment samples, groundwater samples, and the excavation of 49 test pits to identify the types and extent of buried debris/wastes. All samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), herbicides, cyanide, propylene glycol, and metals.

During the RI, chlorinated compounds were detected in groundwater upgradient from Site 3. Subsequent investigations revealed a distinct chlorinated groundwater plume and this became designated as Site 6.

The investigation at Site 6 consisted of the installation of both permanent and temporary groundwater monitoring wells with two groundwater sampling events and the collection of 15 subsurface soil samples.

The results of the RI concluded, with concurrence from the NYSDEC, that Site 2 should be delisted and Sites 3 and 6 should be investigated further.

2.1.2.4 Time Critical Removal Action

The RI identified three AOCs (Areas A, B, and C) in Site 6. In April of 2002, a TCRA was performed. The TCRA consisted of excavating soil from each of these areas to a depth of approximately 8 feet below ground surface (bgs). Approximately 173 cubic yards of soil were removed and disposed off-site. Only two side wall confirmation samples from Area A exceeded soil cleanup objectives for tetrachloroethene (PCE); Areas B and C had no exceedences.

2.1.2.5 Supplemental Data Collection

A SDC sampling program for Site 6 was conducted at the Base in 2002. The SDC consisted of the installation of temporary and permanent well with groundwater sampling and the collection of subsurface soil samples. Results from the SCS indicated the presence of two areas of soil contamination (chlorinated VOCs) above state regulatory cleanup standards: both areas are in close proximity to the areas excavated during the TCRA performed. The groundwater results indicated that a chlorinated hydrocarbon, dissolved phase groundwater plume exists at Site 6. The SDC recommended further remedial measures be preformed for the Site 6 soils and groundwater.

2.1.2.6 Feasibility Study

Following the completion of the SDC sampling program, a FS was developed for Site 6. The FS recommended excavation, treatment, and off-site disposal for soils and enhanced bioremediation for the groundwater.

2.2 SCOPE OF WORK

The overall scope of work for activities at the Schenectady ANGB are:

- To perform Interim Removal Actions (IRAs) at Sites 3 and 6 consisting of removal and off-site disposal of contaminated soil and buried waste;
- To develop a focused feasibility study (FFS) consisting of further groundwater contamination delineation, enhanced bioremediation pilot study, human health and ecological risk assessment, and remedial alternatives evaluation for any residual contamination at Sites 3 and 6.

Site-specific objectives are outlined below:

- Site 3: excavate and dispose off site any contaminated soils and buried wastes from the two Test Pit areas (TP-1 and TP-7), one soil sample area (SS-5), and two geophysical anomalies;
- Site 3: excavated for off-site disposal sediment within the drainage ditch;
- Site 3: excavate all unsaturated soils above the CVOC groundwater plume, stockpile and segregate based on field screening, collect confirmation samples from stockpiled soils with PID readings above 5 ppm, dispose off site any soils with concentrations above SSALs, and use the remaining soil as backfill;
- Site 6: excavate and dispose off site any contaminated soils and buried wastes from the two geophysical anomalies;
- Site 6: while the excavation area above the CVOC groundwater plume is still open, mix an Edible Oil Substrate (EOS) into the groundwater and then install a series of up to four horizontal wells perpendicular to groundwater flow;
- Site 6: install and develop seven 2-inch inner diameter (ID) monitoring wells in the overburden groundwater;
- Site 6: excavate and dispose off site any contaminated soils and buried wastes from the two geophysical anomalies;

- Site 6: install and develop one 4-inch ID monitoring monitoring well to a maximum of 25 feet below the ground surface (bgs) to monitor the bedrock groundwater;
- Site 6: collect three rounds of groundwater samples from eight new and five existing monitoring wells and analyze for VOCs and natural attenuation parameters; and
- Collect water level measurements in new and existing monitoring wells for development of a potentiometric surface map.

All fieldwork will be performed with Level D personal protection equipment (PPE). Upgrade in PPE to Level C or higher (respiratory and dermal protection) is not expected.

2.2.1 Additional Work Operations

The following additional tasks will also be performed as necessary in support of planned site activities:

- Mobilization/Demobilization: Mobilization and demobilization represent limited pre and post-task activities. These activities include driving to and from the site; initial site preparations, such as trailer and toilet facilities setup; and post-work activities, such as removing files and office equipment and general housekeeping.
- Equipment Decontamination: Earth Tech and subcontractor personnel will perform decontamination of equipment used to perform work within controlled work areas.
- Investigative-Derived Waste (IDW) Management: IDW will be collected and categorized as non-hazardous or hazardous. Potentially hazardous IDW (purge water, and decontamination fluids, and soil cuttings [if any]) will be tested and disposed of within 90 calendar days of completing the field activities. Potentially hazardous IDW waste will be staged onsite, then delivered to an IDW storage facility for processing. Non-hazardous IDW (normal trash) will be disposed of in a timely fashion during fieldwork.

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3.0 PROJECT HEALTH AND SAFETY ORGANIZATION

The following is a description of the project's SH&E management organization, including designation of specific duties and responsibilities to the project staff and organizations.

3.1 ORGANIZATIONAL RESPONSIBILITIES

Earth Tech shall serve as the primary organization responsible for control of the work site and management of work activities being conducted for this project. This includes:

- Development of this HASP, which shall apply to all operations conducted on the work site.
- Providing personnel to fulfill the safety-related positions described in Section 3.2.
- Ensuring that all on-site employees, site personnel and visitors meet the HASP-specified training and medical monitoring requirements procedures.
- Performing appropriate occupational exposure and community exposure monitoring.
- Identifying and controlling occupational safety and health exposures associated with site work activities.

Earth Tech will employ subcontractor organizations to support its work activities; these organizations shall be managed directly by Earth Tech and shall, at a minimum, conform to the requirements of this HASP.

3.2 EARTH TECH SAFETY MANAGEMENT STRUCTURE

In exercising its responsibility for site safety management, Earth Tech will appoint personnel to fill the following safety-related positions. Figure 3-1 illustrates the working relationships between the various positions. The responsibilities, authority and qualifications for each position are described below.

3.2.1 Project Manager – Scott Underhill

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 2.0 of SH&E 003, *Operational SH&E Structure and Responsibilities*. The PM will provide the site supervisor with the appropriate work plans for the site.

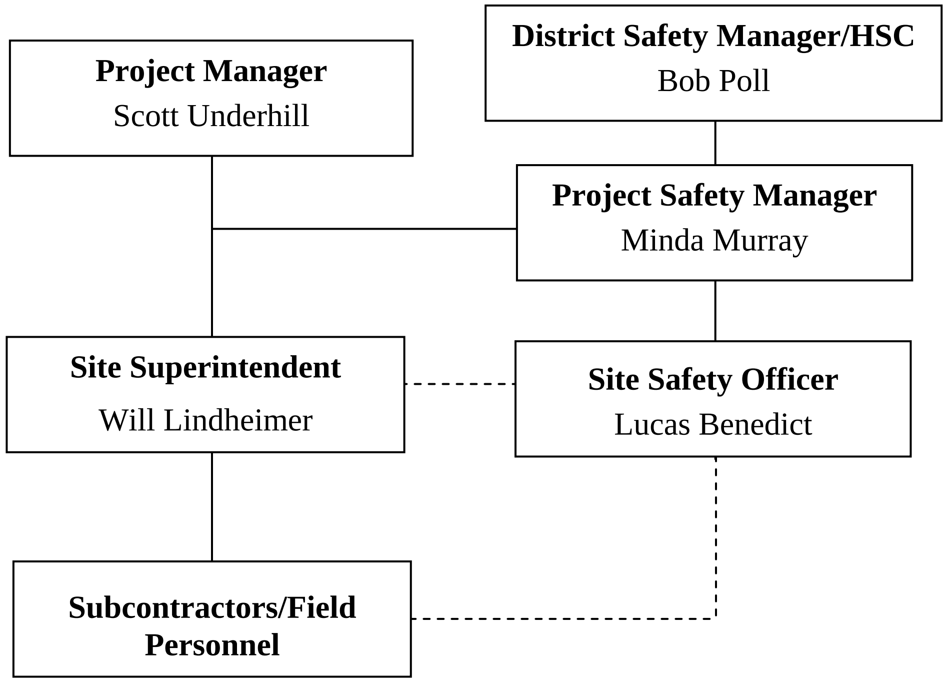
3.2.2 Health and Safety Coordinator – Bob Poll

The Health and Safety Coordinator (HSC) is responsible for overseeing the work performed by the Project Safety Manager, and for reviewing and approving this HASP and any modifications made to it.

3.2.3 Project Safety Manager – Minda Murray

The Project Safety Manager has the overall responsibility to ensure that employees and subcontractors on site are informed and properly implementing all up to date health and safety procedures and requirements per the HASP. In addition, the Site Safety Manager has the authority to direct work operations on the job site according to the HASP.

Figure 3-1.
Environmental, Safety and Health Management Structure



The Site Safety Manager will be the first point of contact for technical support with real-time air monitoring equipment, personnel and perimeter air sampling, and air monitoring documentation. Back-up support will be provided by the Project Safety Manager.

3.2.4 Site Superintendent – Will Lindheimer

The Site Superintendent 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 Superintendent while on site.

3.2.4.1 Responsibilities

The Site Superintendent is responsible to:

- Discuss deviations from the work plan with the SSO and PM.
- Discuss safety issues with the PM, Site Safety Officer (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 ET Safety Procedures.

3.2.4.2 Authority

The Site Superintendent 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 Project Safety Manager, and the PM.

3.2.4.3 Qualifications

In addition to being Hazardous Waste Operations and Emergency Response (HAZWOPER)-qualified (see Section 4.1), the Site Superintendent is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

3.2.5 Site Safety Officer – Lucas Benedict

The Site Safety Officer (SSO) will be on site every day executing the site specific HASP. The SSO will contact the Project Safety Manager with any questions relating to health and safety, real-time air monitoring, and daily air monitoring documentation.

3.2.5.1 Responsibilities

The SSO is responsible to:

- Update the site-specific HASP (in coordination with the Project Safety Manager) 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).
- Inspect the site for compliance with this HASP and ET Safety Procedures using the appropriate audit inspection checklist provided by the Earth Tech SH&E Department
- Work with the Project Safety Manager and Site Supervisor 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 Project Safety Manager 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 (in coordination with the Project Safety Manager), establishing and posting local emergency telephone numbers, and arranging emergency transportation
- Ensure that all site personnel and visitors have 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)
- Present tailgate safety meetings and maintain attendance logs and records

- Discuss potential health and safety hazards with the Project Safety Manager, Site Superintendent, 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.

3.2.5.2 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 Project Safety Manager and the PM.

3.2.5.3 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). The SSO must also have a minimum of 2 years experience in the performance of HAZWOPER site activities and management of site safety activities.

3.2.6 Medical Consultant

Earth Tech retains the services of WorkCare, Inc. to provide all medical monitoring and consulting services for its work operations. WorkCare maintains a staff of medical professionals, including Board-Certified Occupational Physicians, to support this work.

3.3 SAFETY RESPONSIBILITIES OF PERSONNEL ASSIGNED TO THE SITE

The following requirements pertain to all Earth Tech and Earth Tech subcontractor assigned to perform work at the site.

3.3.1 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.

3.3.2 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.

3.4 SAFETY RESPONSIBILITIES OF SUBCONTRACTOR ORGANIZATIONS

Earth Tech's 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 Superintendent prior to beginning work operations. The Site Superintendent 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.

3.5 SAFETY RESPONSIBILITIES OF SITE 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 are required for entry to any controlled work area; visitors must comply with these requirements at all times.

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4.0 GENERAL SAFETY PROGRAMS

4.1 EARTH TECH SAFETY PROCEDURES

Earth Tech Safety, Health and Environmental standard operating procedures (SH&Es) have been developed as guidance documents for specific work tasks. The following is a list of SH&Es found in the Earth Tech *Safety, Health & Environmental Manual for Environmental Practices*. In the table below, SH&Es containing specific information regarding tasks anticipated for this project have been identified.

4.2 SITE-SPECIFIC SAFETY TRAINING

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

1. SH&E 112, *Respiratory Protection Program*
2. SH&E 115, *Hazard Communication Program*
3. SH&E 202, *Safety Meetings*
4. SH&E 301, *Hazardous Waste Operations*

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*.

At the start of each work day the SSO, Site Superintendent or designated alternate will conduct a tailgate safety meeting at the start of each work day. This meeting will include a discussion of the work activities planned for that day, discussion of previous experiences/problems performing this work, and other safety requirements pertinent to the work activities (e.g., special PPE requirements). This meeting can also be used for discussion of previous safety difficulties and corrective measures, as well as training on general safety topics. All personnel assigned to work at the site each day are required to attend the tailgate safety meeting. Documentation of each meeting will be provided using Earth Tech's Tailgate Safety Meeting form. The SSO will maintain copies of this documentation on site for the duration of the project.

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Table 4-1
Applicable SH&E PROCEDURES

(SH&Es anticipated to be at the project are checked in the boxes below)

	SH&E #	SH&E TOPIC		SH&E #	SH&E TOPIC
☒	001	SH&E Policy Statement	☒	403	Drilling
☒	002	SH&E Structure	☒	404	Manual Lifting
☒	003	Operational Structure	☒	405	Handling of Drums and Large Containers
☒	004	SH&E Administrative Support	☒	406	Drum Sampling
☒	101	Injury, Illness, and Near-Miss Reporting	☐	407	Tank and Large Container Sampling
☒	102	Incident Investigation & Review	☒	408	Unknown Hazardous Waste Drum Handling
☒	104	Inspections, Audits, and Corrective Actions	☐	409	Tank Cleaning
☒	108	Medical Monitoring Program	☐	410	Tank Removal / Demolition
☒	109	Hearing Conservation Program	☐	411	Welding, Torch Cutting and Other Hot Work
☒	112	Respiratory Protection Program	☐	412	Line Entry
☒	113	Personnel Protective Equipment	☒	501	Ladders
☒	114	SH&E Training Requirements	☐	502	Scaffolding
☒	115	Hazard Communication Program	☒	503	Machine Guarding
☒	116	Driver and Vehicle Safety	☒	504	Woodworking and Metalworking Machines
☐	118	Confined Space Entry	☒	505	Powered Hand Tools
☐	119	Lockout / Tagout	☒	506	Manual Hand Tools
☒	121	Electrical Safety	☒	508	Fire Extinguishers
☒	122	Environmental Compliance Program	☒	510	High Pressure Washers
☒	124	Heat Stress and Hot Weather Operations	☐	511	All Terrain Vehicles (ATVs)
☒	125	Cold Stress and Winter Operations	☐	512	Fork Lifts
☒	201	General Safety Rules	☒	513	Heavy Equipment (Excavation/Digging)
☒	202	Safety Meetings	☐	514	Manlifts
☒	203	Accident Prevention Program	☐	515	Cranes and Lifting Devices
☒	204	Task Hazard Analyses	☒	516	Equipment Safety Cards
☒	206	Stop Work Authority	☒	517	Traffic Safety
☒	207	Contractor and Subcontractor SH&E	☒	601	Hazardous Materials
☒	208	General Housekeeping	☒	604	Decontamination
☒	209	Disciplinary Actions-Accountability	☒	605	Protection from Solvents
☒	210	Walking - Working Surfaces	☒	606	Flammables and Combustibles
☒	301	Hazardous Waste Operations - HAZWOPER	☐	609	Asbestos Operations
☐	303	OE/Unexploded Ordinance Operations			
☐	309	Working On / Near / Over Water or Ice			
☐	310	Overhead Electrical Lines			
☒	401	Clearing and Grubbing			
☒	402	Excavation & Trenching			

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4.3 HAZWOPER OPERATIONS

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 114, *SH&E Training Requirements*
- SH&E 115, *Hazard Communication Program*
- SH&E 202, *Safety Meetings*
- SH&E 301, *Hazardous Waste Operations*

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*.

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.

4.4 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 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.).

Attachment A provides copies of MSDSs 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.

4.5 OVERALL SITE CONTROL AND 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.

Site security will be obtained through the use of a 6' high chain link perimeter fence that currently surrounds the entire base. The fence will be located outside the excavation areas. In some instances, the existing perimeter fence will need to be relocated since the fence is located over excavation areas. Site security will be ensured throughout all construction phases. Access to the base is through a security check point and access to the base will only be possible through direct communication with the base Environmental Manager and base security. A construction tape barrier will be located outside of all construction areas to prevent entry by unauthorized base personnel. Earth Tech's site representative will maintain a visitor log.

Due to contamination being expected in the subsurface soil and groundwater during construction activities, a "clean" transition area will be established at various locations for access/egress to specific work areas. The "clean" area will be used for equipment/material deliveries, and loading of any contaminated material for on-site treatment or off-site disposal.

4.5.1 Visitors

Visitors to any controlled-work area must be accompanied by an Earth Tech representative, comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area.

4.6 GENERAL SAFETY RULES

All site personnel shall adhere to SH&E 201, *General Safety Rules*, during site operations. In addition, the housekeeping and personal hygiene requirements listed in SH&E 208, *General Housekeeping - Accountability* will also be 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 Personal Hygiene

The following personal hygiene requirements will be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

Potable Water - An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual-use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.

Non-Potable Water - Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating:

Non-Potable Water
Not Intended for Drinking Water Consumption

Toilet Facilities: A toilet will be provided for personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities on-site facilities are not required.

Washing Facilities: Employees will be provided washing facilities (e.g., buckets with water and Alconox) at each work location. The use of water and hand soap (or similar substance) will be required by all employees following exit from the Exclusion Zone, prior to breaks, and at the end of daily work activities.

4.6.4 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.

4.6.5 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*, and SH&E 125, *Cold 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*

4.6.5.1 Responding to Heat-Related Illness

The guidance in Table 4-3 will be used in identifying and treating heat-related illness.

4.6.5.2 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 sun block with a minimum solar protection factor (SPF) of 15.

Table 4-2
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.
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.

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4.7 CONFINED SPACE ENTRY

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.

4.8 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.

4.9 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.

4.10 EQUIPMENT SAFETY CARDS

Equipment safety cards have been produced by the SH&E Department for review prior to operating portable mechanized equipment (e.g., chainsaws, chop saws, power washers, etc.). Equipment safety card requirements are identified in SH&E 516, *Equipment Safety Cards*. Equipment safety cards are to be used as a point of reference prior to using the specified piece of equipment. The cards should be used in conjunction with the manufacturers operating instructions. Personnel must be adequately trained in the tools usage prior to operation, thus using the card as a reminder or THA for additional safe operation. The cards are not a substitute for training, which at a minimum, must consists of having an observed skill set indicating good working knowledge and equipment operation time. The applicable Equipment Safety Cards are included in Attachment B of this HASP.

4.11 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.

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.

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 Attachment C.

5.1.1 Unanticipated Work Activities/Conditions

Operations at the site may require additional tasks not identified in Section 2.2 or addressed in Attachment C THAs. A copy of the SH&E Manual for U.S. Operations will be onsite at all times. Before performing any task not addressed in this HASP, the SH&E manual will be reviewed and the appropriate SH&E documentation will be extracted and added as a supplement. If any task performed onsite is not addressed by published SH&E documentation, a THA must be prepared, and approved by the Safety Professional. All supplements will be sited in Attachment E.

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 and radiological 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 listed in Section 2 are located in the following subsections. Additional data is provided in Chemical Safety Cards, located in Attachment D.

5.2.1 Organic Solvents

For many decades, organic solvents have been widely used in industrial applications to clean and treat surfaces. Usage patterns have changed as new solvents were developed, costs changed, and knowledge about the hazards of particular solvents prompted replacement with less hazardous alternatives. Since disposal sites likely received wastes from a variety of sources over the years, many different solvents may be present. Many types of solvents, especially chlorinated compounds, break down in the environment into intermediate solvent compounds (e.g., trichloroethylene [TCE] can form several isomers of dichloroethylene).

Most solvents present similar hazards through similar modes of exposure (e.g., inhalation and skin contact). The solvents most commonly used in automotive and general maintenance activities are discussed below. Should other solvents be identified, supplemental information will be provided, if necessary. The monitoring requirements and protective equipment (Ansell

Edmont nitrile rubber gloves and air-purifying respirators equipped with organic vapor cartridges attached) would be appropriate.

5.2.1.1 Tetrachloroethylene (Perchloroethylene [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.

5.2.1.2 Trichloroethylene (Trichloroethene [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.

5.2.1.3 Dichloroethylenes (DCE) (1,1-DCE & 1,2-DCE)

1,2-Dichloroethylene is listed as a possible carcinogen, hazardous substance, hazardous waste, and priority toxic pollutant by the U.S. EPA, while 1,1-DCE has not been classified. DCE is used as a chemical intermediate, particularly as a monomer in the production of plastics, but is more likely to be encountered as an environmental contaminant as a result of the environmental breakdown of other chlorinated compounds (especially TCE). DCE has a characteristic sweet smell that resembles carbon tetrachloride or chloroform. Most persons can detect a mild but definite odor at 1,000 ppm in air. Some can detect it at 500 ppm. Vapors containing decomposition products have a disagreeable odor and can be detected at concentrations considerably less than 500 ppm. Exposure to high concentrations results primarily in CNS depression and the associated symptoms of drunkenness that may progress to unconsciousness. Chronic exposure to low concentrations results primarily in injury to the liver and kidneys. The ACGIH TLV for 1,1-DCE is 5 ppm, while the TLV for 1,2-DCE is 200 ppm. Where airborne concentrations of DCE exceed 5 ppm, exposure control can be accomplished through the use of air purifying respirators equipped with organic vapor cartridges. The use of skin protection (chemically-protective gloves, etc.) is required when handling 1,1-DCE-contaminated materials.

5.2.1.4 Vinyl Chloride

Vinyl chloride is a colorless gas, which exhibits a high odor threshold (20 ppm). It is often used as a chemical intermediate in the production of certain types of plastics. It is also found as an environmental contaminant at sites contaminated by more complex chlorinated compounds, where it is a produced as the result of natural degradation. As a gas the primary route of exposure to vinyl chloride is via inhalation. As with many other types of chlorinated and other organic compounds, high airborne concentrations of vinyl chloride have been demonstrated to depress central nervous system function. Lower-level chronic exposure can produce effects to the liver, and vinyl chloride has been shown to produce liver cancer. This carcinogenic effect is of the greatest importance in the establishment of occupational exposure limits. Both the OSHA PEL and ACGIH TLV for vinyl chloride are 1 ppm as an 8-hour time weight average. And since vinyl chloride’s odor threshold greatly exceeds this limit the use of supplied-air respiratory protection is required to control exposures.

5.2.2 BTEX (Aromatic Compounds)

The aromatic compounds of BTEX are generally found together as significant components of petroleum fuels (e.g., diesel fuel). Due to their high vapor pressure and the range and severity of their health effects, they are considered to present the greatest hazard during remedial and site investigation operations. Mitigation measures include the use of chemically-protective gloves and clothing, and air-purifying respirators equipped with organic vapor cartridges.

5.2.2.1 Benzene

Benzene is a known human carcinogen. Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure. The OSHA PEL is 1 ppm, with an action level of 0.5 ppm and a short-term exposure limit of 5.0 ppm. The ACGIH exposure guideline is 0.5 ppm.

5.2.2.2 Toluene.

Exposure to vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, tearing, and a sensation of prickling, tingling, or creeping on the skin that has no objective cause. Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and in severe cases may cause unconsciousness and death. The liquid is irritating to the eyes and the skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated or prolonged contact with the skin may cause drying and cracking. Toluene may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause irreversible liver and kidney injury. The OSHA PEL is 200 ppm; the ACGIH TLV is 50 ppm.

5.2.2.3 Ethylbenzene

Ethylbenzene vapors are severely irritating to the eyes and the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethylbenzene causes irritation; dermatitis, and defatting can also develop. The acute oral toxicity of ethylbenzene is low; however, ingestion of it poses a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are suspected at the levels that produce pronounced, disagreeable skin and eye irritation. The established PEL is set well below this intolerable level. The OSHA PEL and ACGIH TLV are all 100 ppm.

5.2.2.4 Xylene

Liquid xylene is a skin irritant and causes itching, dryness, and defatting; prolonged contact may cause blistering. Inhaling xylenes can depress the CNS, and ingesting it can result in gastrointestinal disturbance and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported. Both the OSHA PEL and ACGIH TLV are 100 ppm.

5.2.3 Total Petroleum Hydrocarbons (Fuels)

Hydrocarbon fuels (including gasoline, diesel fuel and jet fuel) are complex mixtures of hydrocarbons and additives. The constituents of hydrocarbon fuels posses a range of vapor pressures. For highly volatile components, chronic exposures or exposures to a high concentration may cause unconsciousness, coma, and possible death from respiratory failure. Exposure to low concentrations of vapor may produce flushing of the face, slurred speech, and mental confusion. Fuels are also irritating to the skin, and may cause drying and dermatitis as a result of prolonged contact.

Various components and additives of the fuels can themselves present significant additional hazards. The aromatic compounds benzene, toluene, ethylbenzene and xylene (BTEX) are of greatest concern in relation to site investigation activities, and are addressed separately below. However some additives used for performance enhancement (e.g., methyl tert-butyl ether - MTBE), oxygenation (e.g., alcohols and MTBE) and water scavenging (e.g., ethylene glycol methyl ether - EGME) can also present significant hazards as a result of prolonged inhalation or skin exposure. In the past tetra-ethyl and tetra-methyl lead, both of which have been identified as carcinogens and present moderate skin contact hazards, were added to gasoline for anti-knock control.

There are no set limits for petroleum hydrocarbons, however, gasoline guidelines may be used instead. Both the OSHA PEL and ACGIH TLV for gasoline are 300 ppm. Control of inhalation exposure to gasoline (and its various constituents and additives) can be accomplished through the use of air purifying respirators equipped with organic vapor cartridges. The use of skin protection (i.e., chemically-protective gloves) is required when handling gasoline-contaminated materials.

5.2.4 Total Petroleum Hydrocarbons (as Gasoline)

Gasoline is a complex mixture of hydrocarbons and additives, used primarily as a motor fuel. Gasoline possesses a moderate to high vapor pressure, meaning it is highly volatile. The lower explosive limit for gasoline is 1.1 percent concentration in air; fire/explosion can be significant in enclosed spaces where airborne concentrations may accumulate.

Chronic exposures or exposures to a high concentration of gasoline vapor may cause unconsciousness, coma, and possible death from respiratory failure. Exposure to low concentrations of gasoline vapor may produce flushing of the face, slurred speech, and mental confusion. Gasoline is also irritating to the skin, and may cause drying and dermatitis as a result of prolonged contact.

Various components and additives of gasoline can themselves present significant additional hazards. The aromatic compounds benzene, toluene, ethylbenzene, and xylene (BTEX) are of greatest concern in relation to site characterization activities, and are addressed separately below. However, some additives used for octane control (e.g., methyl tert-butyl ether [MTBE]), oxygenation (e.g., alcohols and MTBE), and water scavenging (e.g., ethylene glycol methyl ether [EGME]) can also present significant hazards as a result of prolonged inhalation or skin exposure. In the past, tetra-ethyl and tetra-methyl lead, both of which have been identified as carcinogens and present moderate skin contact hazards, were added to gasoline for anti-knock control.

Both the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) and the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) for gasoline are 300 parts per million (ppm). Control of inhalation exposure to gasoline (and its various constituents and additives) can be accomplished by using air-purifying respirators equipped with organic vapor cartridges. The use of skin protection (e.g., chemically protective gloves) is required when handling gasoline-contaminated materials.

5.2.5 Polyaromatic Hydrocarbons (PAHs)

Polyaromatic hydrocarbons are produced during combustion events due to inadequate oxidation of fuel. PAHs in the pure state are yellowish crystalline solids. They are found in products of incomplete combustion. These chemicals have varying degrees of potency for causing cancer, with benzo(a)pyrene being among the most potent. Exposure may also cause cancer of lungs, skin, bladder or kidneys. Benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, and indeno(1,2,3,c,d)pyrene have been identified as carcinogenic.

This information on PAH compounds is presented for site contaminant awareness. While, the potential for site personnel sustaining significant inhalation exposures to volatilized PAH compounds during the site activities of this project is minimal, there is the potential for inhalation of PAH-contaminated dust, and handling of contaminated soils presents skin exposure hazards. Use of dust suppression techniques (as appropriate) and the proper use of the PPE will adequately protect personnel. Some significant PAH compounds include:

Benzo(a)pyrene	Benzo(a)anthracene
Benzo(b)fluoranthene	Benzo(k)fluoranthene
Benzo(g,h,i)perylene	Indeno(1,2,3,c,d)pyrene

Benzo(d,e,f)phenanthrene

5.2.6 Assessment of Exposure Hazards

Inhalation – Based on concentrations of contaminants previously identified and planned work operations, significant concentrations of airborne contaminants (exceeding 10 percent of any applicable occupational exposure limits) are not expected. However, routine air quality monitoring will be conducted during all intrusive activities to verify that selected protective equipment is adequate.

Skin Contact – Wear proper PPE when there is a chance for chemical to splash or contact skin. This includes safety glasses, proper chemical glove protection, and chemical resistant suit.

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

The following physical hazards may be encountered during operations at the DANG site:

- Slips, trips, and falls
- Overhead
- Push/pull
- Protruding objects
- Noise
- Lacerations
- Heavy lifting
- Vehicle/heavy equipment traffic
- Heat/cold stress
- Manual and mechanized equipment
- Excavations/fall hazards

5.4 BIOLOGICAL HAZARDS

Contact with bodies of water, 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:

- Natural and artificial bodies of water (e.g., lakes, rivers, ponds, lagoons, etc.) may contain a variety of microorganisms. Microorganisms, in particular, present a significant hazard to personnel who may come into contact with water bodies. Contact with microorganisms in water may result in dermatitis, infection (i.e., in cuts/lacerations), digestive distress, and other diseases. Always be aware of areas that may contain excessive amounts of microorganisms. Such areas may include areas of standing water; areas of warm water (i.e., cooling tower effluents, etc.); and areas downstream of municipal wastewater treatment. To prevent exposure to microorganisms in water, always adhere to the following:

  - Wear protective gloves (i.e., nitrile, etc.) and other appropriate PPE to prevent skin contact with water.
  - Never drink from natural or artificial bodies of water. Such water is considered non-potable and is not safe for drinking.

- 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.
- 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.
- 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.

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6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 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 205, *Personal Protective Equipment*, lists the general requirements for selection and usage of PPE. Table 6-1 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 Attachment C.

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, contacts the PM/SSO for the proper training prior to signing this HASP.

6.2 DECONTAMINATION

All requirements for performing personal and equipment decontamination may be found in Earth Tech Environmental Practice Standard SH&E 535, *Decontamination*.

6.3 PPE DOFFING AND DONNING INFORMATION

The following information is to provide field personnel with helpful 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, around respirator, 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.

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Table 6-1
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 Z41 approved safety toe
Safety Glasses		ANSI Z87.1 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 Gloves	Inner: Nitrile Outer: Heavy Duty Nitrile, PVC, Neoprene, Viton	
Protective Chemical Coveralls	Inner: Tyvek® or equivalent Outer: Tychem BR® or equivalent	
Protective Chemical Boots	Rubber, neoprene, PVC	
Level C Respiratory Protection	MSA (Full Face or equivalent) equipped with GMA/P100	Other manufacturer's (Scott, 3M, etc.) equivalent is acceptable.

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7.0 SITE CONTROL

7.1 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 . General examples of zone layouts have been developed for drilling and earth moving activities [(e.g., excavating, trenching, etc.) and are attached to this section.

7.2 CONTROLLED WORK AREAS

Each HAZWOPER controlled work area will consist of the following three zones:

- Exclusion Zone: Contaminated work area.
- Contamination Reduction Zone: Decontamination area.
- Support Zone: Uncontaminated or "clean area" where personnel should not be exposed to hazardous conditions.

Each zone will be periodically monitored in accordance with the air monitoring requirements established in this HASP. The Exclusion Zone and the Contamination Reduction Zone (CRZ) are considered work areas. The Support Zone is accessible to the public (e.g., vendors, inspectors).

7.2.1 Exclusion Zone

The Exclusion Zone is the area where primary activities occur, such as sampling, remediation operations, installation of wells, cleanup work, etc. 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:

- **Excavation**. A distance of 25 feet will be cleared in all directions from the backhoe and the location where the excavated soil is deposited.
- **Drilling**. Determine the mast height of the drill rig. This height will be cleared, if practical, in all directions from the bore-hole location and designated as the exclusion zone. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of spoils piles.

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).

7.2.2 Contamination Reduction Zone

The CRZ is the transition area between the contaminated area and the clean area. Decontamination is the main focus in this area. The decontamination of workers and equipment limits the physical transfer of hazardous substances into the clean area. This area must also be clearly marked with hazard tape and access limited to personnel involved in decontamination. Decontamination procedures are further explained in SH&E 535.

7.2.3 Support Zone

The Support Zone is an uncontaminated zone where administrative and other support functions, such as first aid, equipment supply, emergency information, etc., are located. The Support Zone shall have minimal potential for significant exposure to contaminants (i.e., background levels).

Employees will establish a Support Zone (if necessary) at the site before the commencement of site activities. The Support Zone would also serve as the entry point for controlling site access.

7.3 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.

7.3.1 Visitor Access

Visitors to any controlled-work area must be accompanied by an Earth Tech representative, comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area.

7.4 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.
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.

Base security personnel will provide security during off-duty hours. In addition, all equipment will be secured during off-duty hours.

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Figure 7-1
Drilling Site Control Layout

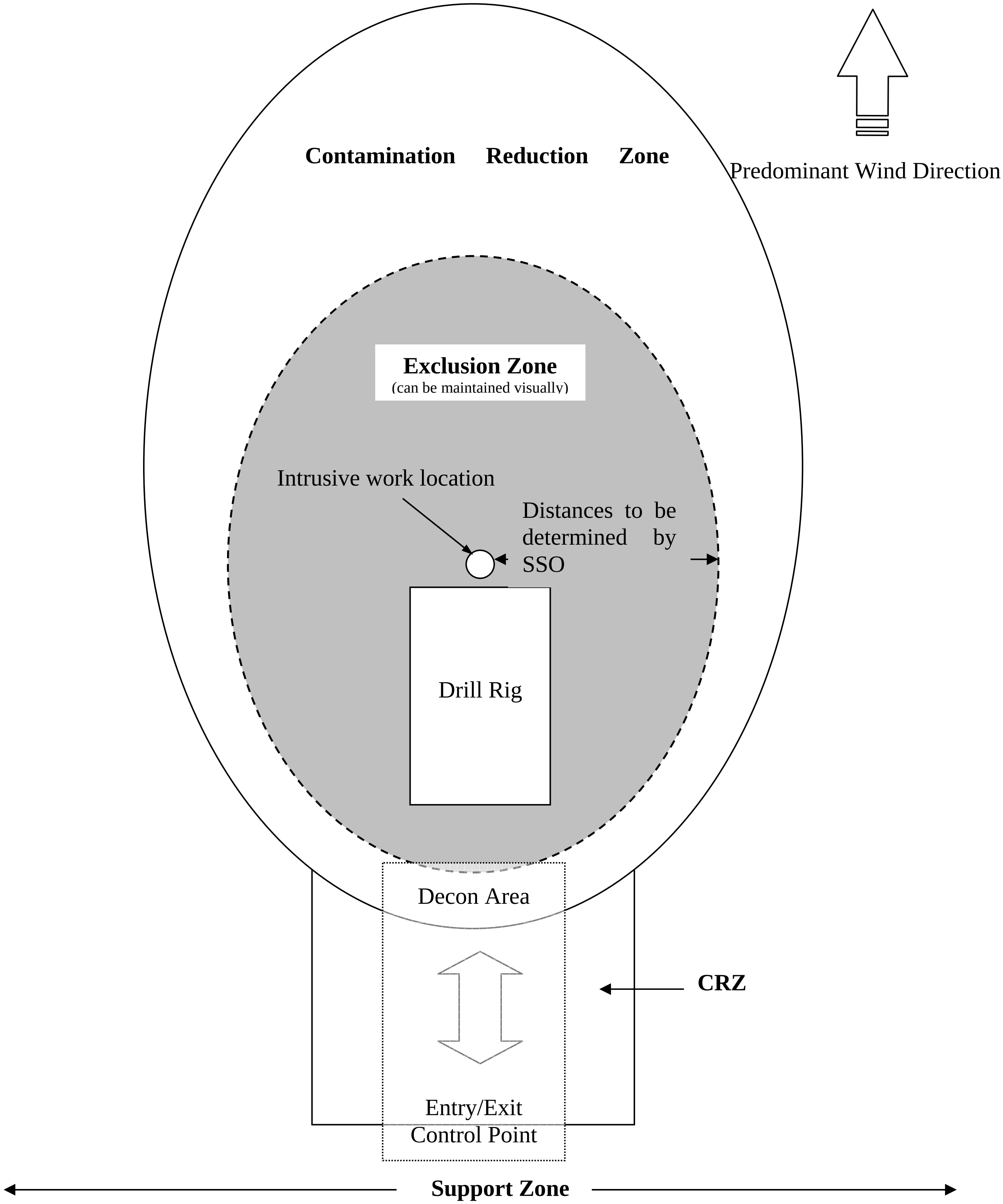

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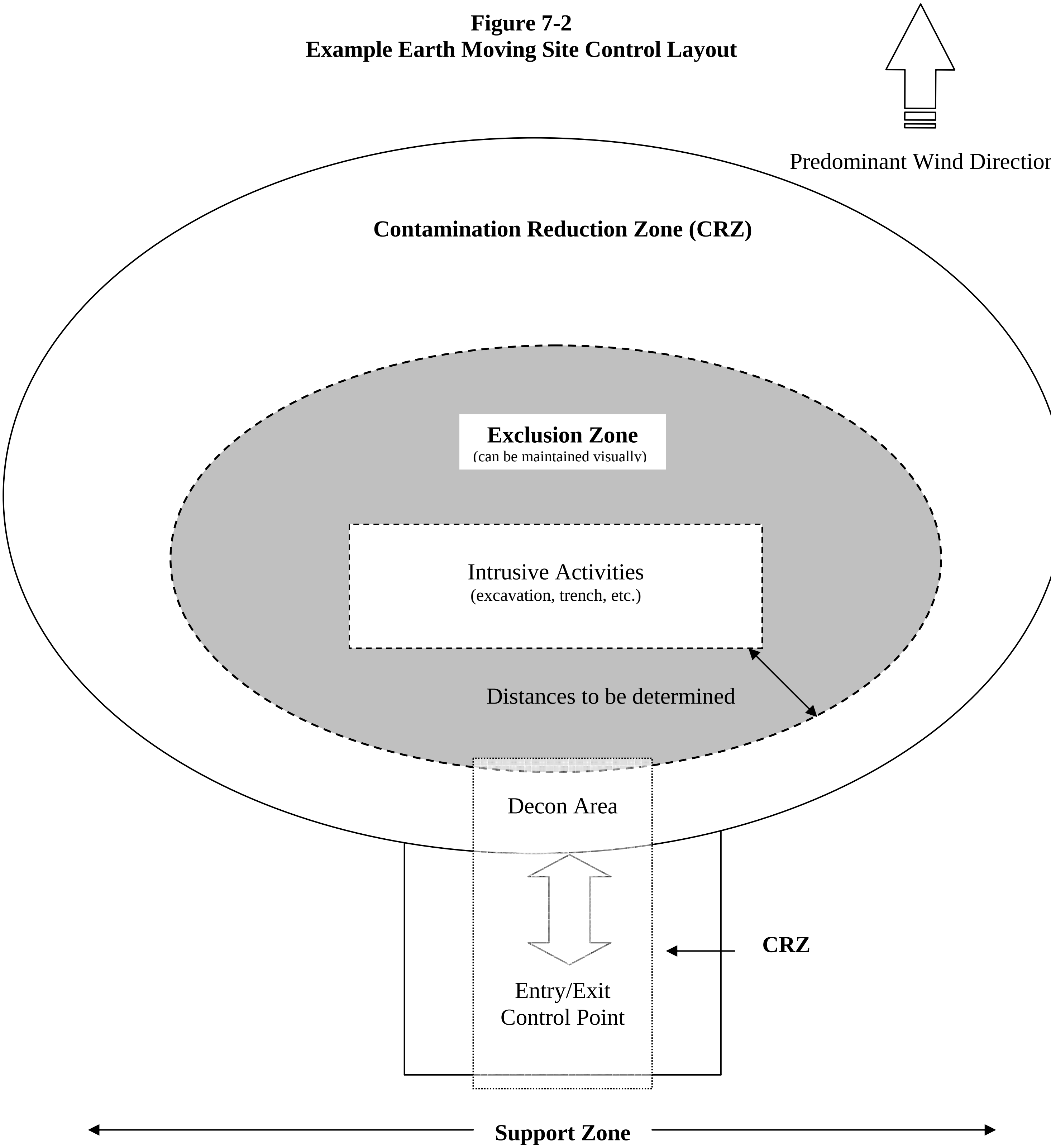
Figure 7-2
Example Earth Moving Site Control Layout



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8.0 SITE PREPARATION ACTIVITIES

This group of activities will encompass tasks required to prepare the site for remedial operations as covered in the SOW.

8.1 WORKER QUALIFICATIONS AND TRAINING

The above activities are all non-HAZWOPER, no special worker qualifications or training is required.

8.2 TASK IDENTIFICATION AND HAZARD ASSESSMENT

8.2.1 Task Identification

The following tasks are associated with the above activities:

1. Mobilization/Demobilization
2. General Labor Activities
3. Utility Clearance and Identification
4. Non-excavation Earthworking Activities (Clearing and Removing of Vegetation and Structures; Installing Erosion and Sediment Control and Fencing; Surveying; Traffic Control; Sample Collection; Decontamination; Remediation Derived Waste Management)
5. Excavation of Soils and Sediments
6. Drilling

A THA has been prepared for each of these tasks, and can be found in Attachment C. Each THA specifies the scope of activities, identifies the related hazards and specifies appropriate health and safety procedures and mitigation measures, as well as any additional requirements (e.g., monitoring procedures) specific to the work being performed.

8.2.2 Hazard Assessment

The following is a summary of the hazards associated with the above work activities. The hazards associated with individual tasks are specified in each THA.

8.2.2.1 Exposure to Environmental Contaminants

The presence of surface contamination is limited. Since these activities are non-intrusive there is no significant potential for exposure to environmental contaminants.

8.2.2.2 Exposure to Physical Hazards

The work activities above present the following physical hazards to personnel:

1. Heavy equipment operations
2. Fall hazards
3. Slip, and trip hazards

4. Hazardous noise exposure
5. Operation of powered hand tools
6. Electrical safety hazards

Protective measures for the hazards associated with each work task are described in the individual THAs.

8.2.2.3 Biological Hazards

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).

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). If bitten by insects, see a doctor if there is any question of an allergic reaction.

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.

8.3 TASK-SPECIFIC OPERATIONAL SAFETY PROCEDURES

The following safety procedures are applicable to the work activities described in this Section. The specific procedures applicable to each work task are specified in each THA.

8.3.1 Earth Tech Safety Procedures

The following Earth Tech Safety Procedures are applicable to the work activities addressed in this Section:

- SH&E 210 *Walking-Working Surfaces Protection*
- SH&E 401 *Clearing and Grubbing*
- SH&E 404 *Manual Lifting*
- SH&E 505 *Powered Hand Tools*
- SH&E 506 *Manual Hand Tools*
- SH&E 513 *Heavy Equipment*

8.3.2 Supplemental Safety Procedures

8.3.2.1 Hazardous Noise Environments

Working around large equipment often creates excessive in use and noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech has compiled noise monitoring data which indicates that work locations within 25 feet of operating heavy equipment (drill rigs) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (ear plugs or ear muffs, minimum noise reduction rating of 25 dB) within 25 feet of any operating piece of heavy equipment.

8.4 WORK AREA CONTROL

There is no special site control issue associated with the scope of activities addressed in this Section.

8.5 PERSONAL PROTECTIVE EQUIPMENT

All work activities associated with the scope of activities addressed in this Section can be performed using the non-HAZWOPER work ensemble, consisting of:

- Hardhat
- Safety glasses w/sideshields (ANSI-compliant)
- Safety-toed work boots (ANSI-compliant)
- Work clothing or coveralls
- Hearing Protection (where required)

8.6 DECONTAMINATION

8.6.1 Decontamination of Personnel

Contact with site contamination will not be significant, therefore decontamination procedures are unnecessary for personnel performing the work activities addressed in this Section.

8.6.2 Decontamination of Equipment

Contact with site contamination will not be significant, therefore decontamination procedures are unnecessary for equipment and materials used during the work activities addressed in this Section.

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9.0 ACTIVITY SPECIFIC REQUIREMENTS

Earth Tech personnel will perform various activities listed below during the scheduled operations detailed in the SOW.

9.1 DESCRIPTION OF WORK ACTIVITIES

The following activities will be performed:

- Performance of occupational exposure monitoring of air quality in the various work areas
- Excavation and onsite staging of suspect soils for reuse or offsite disposal
- Installation and development of overburden monitoring wells
- Installation and development of bedrock monitoring wells
- Installation of horizontal injection wells
- Movement of the associated equipment related to these tasks
- Decontamination of vehicles and equipment leaving the work site and Exclusion Zones
- Substrate injection to enhance bioremediation
- Soil and groundwater sampling
- General site maintenance

9.2 OCCUPATIONAL EXPOSURE MONITORING

Monitoring procedures will be employed during site activities to assess employee exposure to chemical and physical hazards. Monitoring will consist primarily of onsite determination of various parameters (e.g., airborne contaminant concentrations and heat stress effects), but may be supplemented by more sophisticated monitoring techniques, if necessary.

Monitoring shall be performed within each work area on site in order to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in each THA (Attachment C) as work is performed.

9.2.1 General Requirements

Table 9-1 specifies the real-time monitoring equipment which will be used for this project.

9.2.1.1 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions, the concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigative actions, etc.) must be implemented prior to commencing activities at the specific work area. Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSO.

Table 9-1
Occupational Exposure Monitoring Parameters and Equipment

Instrument	Manufacturer/Model*	Substances Detected
Photo Ionization Detector (PID)	RAE Systems multiRAE (min. 10.2 eV bulb)	Volatile Organic Compounds
Colorimetric Detector Tubes	Sensidyne Draeger	Benzene 0.5–10 ppm
Combustible Gas Indicator (CGI) May be combined with individual or multi-gas detectors.	RAE Systems multiRAE	Explosivity

Reasons to upgrade:

- Known or suspected presence of dermal hazards.
- Occurrence or likely occurrence of gas, vapor, or dust emission.
- Change in work task that will increase the exposure or potential exposure to hazardous materials.

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected.
- Change in site conditions that decrease the potential hazard.
- Change in work task that will reduce exposure to hazardous materials.
- Monitoring Procedures

9.2.1.2 Monitoring Equipment Calibration

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer’s recommendations. If the owner’s manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or off-site migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

9.2.1.3 Personal Sampling

Should site activities warrant performing personal sampling to better assess chemical exposures experienced by Earth Tech employees, the SSO, under the direction of a Certified Industrial Hygienist (CIH), will be responsible for specifying the monitoring required. Within five working days after the receipt of monitoring results, the CIH will notify each employee, in writing, of the results that represent that employee's exposure. Copies of air sampling results will be maintained in the project files.

Should the site activities warrant, the subcontractor will ensure its employees' exposures are quantified via the use of appropriate sampling techniques. The subcontractor shall notify the employees sampled in accordance with health and safety regulations, and provide the results to the SSO for use in determining the potential for other employees' exposure.

9.2.2 Monitoring of Excavation and Drilling Activities

When excavation of onsite soils and/or the subsurface drilling during the installation of vertical monitoring wells occur, real-time air monitoring will be employed to ensure that personal exposures are kept within accepted occupational exposure standards for airborne concentrations of site contaminants or vehicle exhaust emissions. The monitoring program will consist of air quality measurements in worker breathing zones only.

Monitoring will be accomplished using the instrumentation presented in 8-1. Exposure monitoring will be performed by a dedicated monitoring technician, who will utilize the instrumentation as portable, hand-held units. Monitoring will be conducted in breathing zones at 30 minute intervals for the following personnel:

- Excavator operator
- Field personnel operating nearest the excavation location
- Field personnel operating nearest the drill rig adjacent to boring

Monitoring will be conducted in accordance with the requirements in Table 9-2. Table 9-2 also specifies response actions/PPE upgrade criteria for use in determining response to breathing zone readings. Monitoring results will be recorded.

9.2.3 Hazardous Noise Monitoring

Upon initiation of full scale production operations, noise levels will be monitored to ensure that each Exclusion Zone or other Controlled Work Area fully encompasses all locations where hazardous noise levels are present (85 dBA or greater). The SSO will use a sound level meter to survey the perimeter of each CWA, while all onsite heavy equipment within the zone is being operated simultaneously. If the sound pressure level exceeds 85 dBA at any location along the site perimeter, the site operations will be modified to reduce the noise level to below 85 dBA.

9.2.4 Operational Safety Procedures

Occupational exposure monitoring will be conducted concurrently with other work activities, and will occur within designated HAZWOPER Exclusion Zones associated with those activities. The hazards associated with work are identical to those associated with the concurrent work activity.

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Table 9-2.
Breathing Zone Monitoring Action Levels

PARAMETER	MONITORING INTERVAL	RESPONSE LEVEL (above background)	RESPONSE
VOCs	Every 30 minutes during excavation activities	< 10 units	Continue work in Modified Level D and continue monitoring.
		10 – 20 units (Sustained for more than 5 minutes)	Monitor for benzene. Continue work in Modified Level D unless benzene is present above 1.0 ppm, and continue monitoring.
		20 – 50 units (Sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge), and continue monitoring.
		> 50 units (Sustained for more than 5 minutes)	Cease work.
Benzene (By Colorimetric Tube)	30-minute intervals where indicted by VOC readings	< 1.0 ppm (No color change)	Continue work in Modified Level D and continue monitoring.
		> 1.0 ppm	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge).
Airborne Particulates (by miniRam)	Every 30 minutes when soil handling is occurring	<3 mg/m^3	Continue work in Modified Level D and continue monitoring.
		3 – 15 mg/m^3	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (N100 cartridge).
		> 15 mg/m^3	Cease work.

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Personnel performing occupational exposure monitoring will be required to meet the qualifications, PPE requirements, and operational requirements pertaining to the work being supported, as designated in the work activity's THA (see Attachment C). Consequently, separate THAs will not be prepared for the occupational exposure monitoring activities.

9.3 DECONTAMINATION ACTIVITIES

Earth Tech will be establishing a main decontamination station for large equipment and smaller portable stations for personal decontamination.

9.3.1 Main Decontamination Area

All heavy equipment exiting any HAZWOPER Exclusion Zone will be properly decontaminated on the main decontamination pad using a high-pressure washer and other proper equipment, (i.e. brushes, detergent). Should equipment become heavily soiled, then the use of a water sprayer and/or scrapers and brushes shall be used before being decontaminated. In general, the high pressure washer will be used for cleaning equipment: every effort will be made to remove adhering material with brushes and the sprayer. This decontamination of heavy soils will be performed over contaminated soil areas and the water will collected on poly sheeting. The pressure washer will be high pressure low volume washer to minimize the amount of waste water generated.

All equipment will be inspected prior to being demobilized from the project site.

9.3.2 Personal Decontamination

Personal decontamination stations will be erected at the designated entry/exit points of each HAZWOPER Exclusion Zone. Requirements for these decontamination stations are specified in SH&E 604, *Decontamination*.

9.3.3 Operational Safety Procedures

The following safety procedures will be implemented during decontamination activities. Additional details can be found in the Task Hazard Analysis found in Attachment C.

- SH&E 112 *Respiratory Protection*
- SH&E 113 *Personal Protective Equipment*
- SH&E 405 *Handling Drums and Large Containers*
- SH&E 510 *High Pressure Washers*
- SH&E 601 *Hazmat Shipping*

9.4 GENERAL SITE MAINTENANCE

The Site will be maintained in a professional manner at all times during construction. Stone roadways for transport vehicles and water spray will prevent dust emissions at the site. The site will be neat, kept clean, and appear organized during construction operations. During off work hours, the site will be secured through a locked perimeter fence with all stockpiles properly covered and clean fill stockpiles neatly graded to prevent odors or dust emissions. A trash dumpster will be placed on-site for collection of trash.

9.4.1 Operational Safety Procedures

The following safety procedures will be implemented during site maintenance activities. Additional details can be found in the Task Hazard Analysis found in Attachment C.

- SH&E 116 *Driver Vehicle Safety*
- SH&E 121 *Electrical Safety Program*
- SH&E 122 *Environmental Compliance Program*
- SH&E 208 *General Housekeeping – Accountability*
- SH&E 210 *Walking-Working Surfaces Protection*
- SH&E 405 *Handling Drums and Large Containers*
- SH&E 505 *Powered Hand Tools*
- SH&E 506 *Manual Hand Tools*
- SH&E 507 *Power Actuated Tools*
- SH&E 508 *Fire Extinguishers*

9.5 SUPPLEMENTAL SAFETY PROCEDURES

As discussed in Section 5.0, personnel may be exposed to a variety of chemical, physical, and biological hazards. The requirements for the control of many of these hazards these hazards is discussed in Standard Operating Procedures found listed in Table 4-1. Specifically, the 300 and 400 series of SH&Es provide specific information regarding hazard control and the requirements necessary to complete tasks in a safe manner.

9.5.1 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 appropriate agency is Dig Safely New York. The phone number is provided in the Emergency Contacts list found in Section 8. For additional requirements, refer to SH&E 310, *Overhead Electrical Line*, SH&E 402, *Excavation and Trencing*; and SH&E 403, *Drilling.*

9.5.2 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*.

9.5.3 Heavy Equipment and Vehicle Operations

Heavy equipment and site vehicles present serious hazards to site personnel. Blind spots, failure to yield, and other situations may cause heavy equipment/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.

For additional requirements, refer to SH&E 513, *Heavy Equipment*.

9.5.4 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.

9.5.5 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. Face shields may be required to provide additional face protection from flying debris.
- Wear appropriate work gloves if suitable. Work gloves may reduce the severity of burns and cuts/lacerations.
- Wear ANSI-approved safety-toed work boots. Protective footwear reduces the risk and severity of injuries to the foot.
- Wear appropriate hearing protection to avoid long term hearing damage due to overexposure to loud noises and equipment.
- 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.

9.5.6 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.

9.5.7 Excavations and Trenches

Excavations and trenches present workers with a variety of hazards. If not properly sloped, shored, or boxed, trench walls may collapse and trap workers under the weight of the soil. Soil contaminants and other chemical hazards (e.g., carbon monoxide from equipment/vehicles) may result in a hazardous atmosphere. Confined space entry procedures may need to be followed if the potential for a hazardous atmosphere exists. Buried utilities may exist where excavations/trenches will be placed. Always contact the local utility locator service prior to beginning excavations. Refer to SH&E 402, *Excavation and Trenching* for additional requirements.

10.0 INTERIM REMEDIAL ACTION ACTIVITIES

This section discusses the IRAs regarding investigation activities proposed for Sites 3 and 6. The various tasks are reviewed below. These will be followed by backfill and site restoration activities.

10.1 DESCRIPTION OF WORK ACTIVITIES

10.1.1 Soil Removal IRA

Soil Excavation Activities (Site 3):

- Excavation and off-site disposal of the two test pit locations (TP-1 and TP-7), one surface soil location (SS-5), and sediment from the drainage ditch to the limits identified in the Work Plan. Earth Tech will contain, characterize, and dispose of all investigation- or remediation-derived waste (IDW/RDW) in accordance with the March 2, 2005 ANG Policy CEV 05-1- Policy on ANG IDW/RDW management.
- Investigation of two geophysical anomalies and off-site disposal of the excavated metallic objects along with associated contaminated soil.
- Confirmation sampling of all excavated areas using sidewall and base sampling for the test pit and surface soil excavations, with continued excavation of any areas where the confirmation sampling does not meet SSALs.
- Once confirmation samples show excavations are complete, the open areas will be backfilled with select fill, and graded and resurfaced to previous conditions.

Soil Excavation Activities (Site 6):

- Excavation of the entire area residing above the chlorinated hydrocarbon plume as delineated by the 50 ppb VOC isopleth shown in Figure 6-11, Extent of Groundwater Contamination – Site 6 (Supplemental Data Collection for Site 6, August 2003).
- All excavated soils will be field-screened during excavation and segregated based on PID readings and field observations. If PID readings are above 50 ppm, or if the soil is visually stained, then the soil will be stockpiled, characterized, and disposed offsite. If PID readings are between 5 ppm and 50 ppm, then the soils will be stockpiled, characterized, and if found contaminated, disposed off-site; uncontaminated soils will be used for backfill. Soils with PID readings below 5 ppm will be stockpiled onsite and used for backfill.
- Soils will be excavated to a maximum of 1-foot below groundwater (estimated to be between 5 feet and 7 feet bgs).
- As the excavation proceeds, horizontal wells will be installed at the base of the excavation perpendicular to groundwater flow. The 4-in horizontal wells will be installed at 40-foot spacing and extend across the excavation. At both ends and in the center of each horizontal well, vertical risers will be installed to grade, allowing an opening to which a substrate can be added to enhance bioremediation of the chlorinated hydrocarbons in the groundwater.

- Investigation of two geophysical anomalies and off-site disposal of the excavated metallic objects along with associated contaminated soil.
- Once an area has been excavated and the horizontal wells have been installed, the area will be backfilled, either with excavated material not taken offsite or with select fill.

10.1.2 Groundwater Investigation

Earth Tech will perform the following groundwater investigation following the completion of the soil removal IRA.

Groundwater Investigation Activities:

- Install eight new monitoring wells, all screened in the overburden and weathered shale.
- In addition, one bedrock monitoring well downgradient of the VOC plume will be installed to a depth of 25 feet. This bedrock monitoring wells will be used to determine if the bedrock shale is water bearing, and if so, if any chlorinated hydrocarbons have impacted it.
- Once all monitoring wells have been installed, Earth Tech will sample up to 13 monitoring wells: eight new monitoring wells and five existing monitoring wells. The samples will be analyzed for VOCs, biological activity (including metabolic acids), and natural attenuation parameters. The results from these samples will be used to delineate the chlorinated hydrocarbon plume after the source area has been removed and determine the extent to which biological degradation is occurring. Samples will be collected using low-flow sample techniques.
- IDW such as drilling cuttings, and well development water will be captured and stored in 55-gallon drums until the contents can be characterized. Once characterized, non-hazardous soils and sediments will be disposed at a landfill with the non-hazardous soils excavated during soil remediation. Investigation-derived water will be characterized for disposal and transported to a proper disposal facility.

10.1.3 Site Restoration Activities

10.1.3.1 Backfilling and Compaction

Backfill of an area will be completed after a post excavation survey of an area has been performed, soil samples have been collected, and the analysis approved by NYSDEC. The backfilled areas will then be compacted in 12-inch lifts using a vibratory roller. Areas not requiring confirmation sampling will be backfilled as soon as practicable.

10.1.3.2 Restoration

Upon completion of placing and compacting all backfill, approved topsoil will be placed at a thickness of 6” to meet the proposed finished grades identified on the contract drawings. As areas are raised to finished grade, a local Hydroseeding subcontractor will be utilized to install seed, fertilizer, and mulch. Surface erosion control material will be selected based upon the physical characteristics of the topsoil and the degree of slope to be covered. Additional silt fence will be installed to control erosion in problem areas.

10.2 WORKER QUALIFICATIONS AND TRAINING

The above activities represent a mixture of HAZWOPER and non-HAZWOPER (as identified for each task, below). Since a single workforce will perform the majority of these activities all personnel will be required to be HAZWOPER qualified per Section 4.3 unless specifically exempted in the individual THAs (non-HAZWOPER tasks only).

10.3 TASK IDENTIFICATION AND HAZARD ASSESSMENT

10.3.1 Task Identification

The following tasks are associated with the above activities:

1. Excavation, handling and removal of impacted soils - HAZWOPER
2. Excavation and removal of geophysical anomalies – non-HAZWOPER
3. Excavation and handling of clean soils – non-HAZWOPER
4. Installation of groundwater monitoring wells – HAZWOPER
5. Backfill activities – non-HAZWOPER
6. Final surface restoration – non-HAZWOPER

A THA has been prepared for each of these tasks, and can be found in Attachment C. Each THA specifies the scope of activities, identifies the related hazards and specifies appropriate health and safety procedures and mitigation measures, as well as any additional requirements (e.g., monitoring procedures) specific to the work being performed.

10.3.2 Hazard Assessment

The following is a summary of the hazards associated with the above work activities. The hazards associated with individual tasks are specified in each THA.

10.3.2.1 Exposure to Environmental Contaminants

The following environmental contaminants are present at occupationally-significant concentrations on site and may be encountered during the activities addressed in this Section:

- **Volatile Organic Compounds**

  Benzene, toluene, ethylbenzene, and xylenes (BTEX)
  Petroleum products (diesel, gasoline)
  Chlorinated hydrocarbons (PCE, TCE, 1-2 DCE, VC)

The hazards and protective measures associated with these contaminants are presented in Attachment C.

10.3.2.2 Assessment of Hazards:

- **HAZWOPER Tasks:** Intrusive activities involving drilling/excavation/handling of contaminated materials has the potential to cause significant exposures to site personnel through inhalation, skin contact, and ingestion to the contaminants found in the soils and water (see Section 4). Exposure can exceed permissible exposure limits for any or all contaminants and have the potential to produce significant harm to individuals who are not adequately protected (use of proper PPE) and perform proper decontamination when leaving Exclusion Zones.

- **Non-HAZWOPER Tasks:** Activities involving the excavation/handling or clean soils, as well as the site restoration activities, have no significant potential for exposure to site contaminants by any of the exposure routes.

10.3.2.3 Exposure to Physical Hazards

The HAZWOPER and non-HAZWOPER work activities above present the following physical hazards to personnel:

1. Heavy equipment operations
2. Excavation safety
3. Fall hazards
4. Slip, and trip hazards
5. Hazardous noise exposure

Protective measures for the hazards associated with each work task are described in the individual THAs.

10.3.2.4 Biological Hazards

There are no significant biological hazards associated with the work activities addressed in this section, primarily due to the use of the containment structure for most planned work activities.

10.4 TASK-SPECIFIC OPERATIONAL SAFETY PROCEDURES

The following safety procedures are applicable to the work activities described in this Section. The specific procedures applicable to each work task are specified in each THA.

10.4.1 Earth Tech Safety Procedures

The following Earth Tech Safety Procedures are applicable to the work activities addressed in this Section:

- SH&E 109 *Hearing Conservation*
- SH&E 112 *Respiratory Protection*
- SH&E 113 *Personal Protective Equipment*
- SH&E 115 *Hazard Communication*
- SH&E 210 *Walking-Working Surfaces Protection*
- SH&E 402 *Excavation and Trenching*
- SH&E 403 *Drilling*
- SH&E 404 *Manual Lifting*
- SH&E 410 *Tank Removal and Demolition*
- SH&E 513 *Heavy Equipment*

10.4.2 Supplemental Safety Procedures

10.4.2.1 Hazardous Noise Environments

Working around large equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech has compiled noise monitoring data which indicates that work locations within 25 feet of operating heavy equipment (drill rigs) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (ear plugs or ear muffs, minimum noise reduction rating of 25 dB) within 25 feet of any operating piece of heavy equipment.

10.5 PERSONAL PROTECTIVE EQUIPMENT

The THAs for each individual work activity will define the specific PPE needs for the work task. These requirements will be based on the following guidelines:

HAZWOPER Activities: Requirements for PPE use will vary based on activity, and results of the on-going occupational exposure monitoring. The primary HAZWOPER ensembles anticipated for use will be the Modified Level D ensemble, and the Level C ensemble. Specific equipment requirements for each of these ensembles can be found in SH&E 301, *Hazardous Waste Operations*. In addition, personnel utilizing these PPE ensembles will be required to wear rubber boot covers or rubber safety-toed boots.

Where chemically-protective gloves are specified, the following types will be used:

Inner gloves: Best Safety N-DEX or equivalent

Outer gloves: Ansell-Edmont SOL-VEX or equivalent

Non-HAZWOPER Activities: For non-HAZWOPER activities can be performed using the non-HAZWOPER work ensemble, consisting of:

- Hardhat
- Safety glasses w/sideshields (ANSI-compliant)
- Safety-toed work boots (ANSI-compliant)
- Work clothing or coveralls
- Hearing Protection (where required)

10.6 DECONTAMINATION

10.6.1 Decontamination of Personnel

Personal decontamination stations will be erected at the designated entry/exit points of each HAZWOPER Exclusion Zone. Requirements for these decontamination stations are specified in SH&E 604, *Decontamination*.

10.6.2 Decontamination of Equipment

Section 9.3 establishes the specific site decontamination methods which will be used for all vehicles and equipment entering any HAZWOPER Exclusion Zone.

11.0 ENHANCED BIOREMEDIATION TREATABILITY STUDY

Earth Tech will conduct a field-scale treatability study of enhanced bioremediation technology, since site data indicates biological dechlorination presently occurs.

Following collection of the baseline groundwater samples, Earth Tech will perform the enhanced bioremediation treatability study as described below:

11.1 DESCRIPTION OF WORK ACTIVITIES

Substrate Injection Activities:

- Using the horizontal well network installed during the IRA, Earth Tech will inject a substrate into the groundwater to promote the growth of anaerobic bacteria. The substrate will be used to biostimulate naturally occurring (or augmented) bacteria. During their growth process, the chlorinated hydrocarbons will be co-metabolized under anaerobic conditions to vinyl chloride. A downgradient oxygenating barrier would be installed to degrade the vinyl chloride to carbon dioxide and water. If the baseline sampling results indicate nutrient limiting conditions, then additional nutrients (e.g., nitrogen or phosphorus) may also be injected along with the substrate. Samples will be collected using low-flow sampling techniques.
- The amount of substrate and nutrients to be injected, if needed, will be based on the results of the baseline sampling program.
- Following the injections, three rounds of groundwater samples will be collected using the same monitoring network used during the baseline sampling. These samples will be collected one month, three months, and six months after the injections. All samples will be analyzed for VOCs, biological activity (including metabolic acids), and natural attenuation parameters.

11.2 WORKER QUALIFICATIONS AND TRAINING

Site investigation activities are considered to be HAZWOPER activities. Personnel involved in this work are required to meet the HAZWOPER qualifications found in Section 4.3.

11.3 TASK IDENTIFICATION AND HAZARD ASSESSMENT

11.3.1 Task Identification

The following tasks are associated with the above activities:

1. Substrate Injection
2. Sample Collection and Handling

A THA has been prepared for each of these tasks, and can be found in Attachment C. Each THA specifies the scope of activities, identifies the related hazards and specifies appropriate health and safety procedures and mitigation measures, as well as any additional requirements (e.g., monitoring procedures) specific to the work being performed.

11.3.2 Hazard Assessment

The following is a summary of the hazards associated with the above work activities. The hazards associated with individual tasks are specified in each THA.

11.3.2.1 Exposure to Environmental Contaminants

The following environmental contaminants are present at occupationally-significant concentrations on site and may be encountered during the activities addressed in this Section:

- **Volatile Organic Compounds**

  Benzene, toluene, ethylbenzene, and xylenes (BTEX)

  Petroleum products (disel, gasoline)

  Chlorinated hydrocarbons (PCE, TCE, 1-2 DCE, VC)

The hazards and protective measures associated with these contaminants are presented in Attachment D.

11.3.2.2 Exposure to Physical Hazards

The work activities above present the following physical hazards to personnel:

- Slip, and trip hazards

Protective measures for the hazards associated with each work task are described in the individual THAs.

11.3.2.3 Biological Hazards

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).

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). If bitten by insects, see a doctor if there is any question of an allergic reaction.

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.

11.4 TASK-SPECIFIC OPERATIONAL SAFETY PROCEDURES

The following safety procedures are applicable to the work activities described in this Section. The specific procedures applicable to each work task are specified in each THA.

11.4.1 Earth Tech Safety Procedures

The following Earth Tech Safety Procedures are applicable to the work activities addressed in this Section:

- SH&E 112 *Respiratory Protection*
- SH&E 113 *Personal Protective Equipment*
- SH&E 115 *Hazard Communication*
- SH&E 201 *General Safety Rules*
- SH&E 210 *Walking-Working Surfaces Protection*
- SH&E 301 *Hazardous Waste Operations (HAZWOPER)*
- SH&E 506 *Manual Hand Tools*
- SH&E 513 *Traffic Safety*

11.4.2 Supplemental Safety Procedures

No additional safety procedures are warranted by the activities addressed in this Section.

11.5 WORK AREA CONTROL

While performing this work a HAZWOPER controlled work area will be established, consisting of an Exclusion Zone (10-feet in all directions from the sample point), and a Contamination Reduction Zone for performing personal decontamination.

11.6 PERSONAL PROTECTIVE EQUIPMENT

All work activities associated with the scope of activities addressed in this Section can be performed using the HAZWOPER Level D work ensemble, consisting of:

- Hardhat
- Safety glasses w/sideshields (ANSI-compliant)
- Safety-toed work boots (ANSI-compliant)
- Work clothing or coveralls
- Hearing Protection (where required)

In some instances, a modified HAZWOPER Level D work ensemble would be necessary. Additional protective measures would include:

- Tyvek®/Saranex® SL coveralls
- Nitrile gloves
- Neoprene overboots
- Face Shield Hardhat

11.7 DECONTAMINATION

11.7.1 Decontamination of Personnel

Contact with site contamination will not be significant, therefore decontamination procedures are unnecessary for personnel performing the work activities addressed in this Section.

11.7.2 Decontamination of Equipment

Contact with site contamination will not be significant, therefore decontamination procedures are unnecessary for equipment and materials used during the work activities addressed in this Section. For additional decontamination procedures refer to Section 9.3.

12.0 EMERGENCY RESPONSE PLANNING

12.1 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 will be reviewed by all personnel prior to the start of field activities.

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

12.1.1 Emergency Response Coordinator

Prior to beginning site activities, the PM will complete Table 9-1 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 102.

Table 12-1
Emergency Planning

(Site Safety Officer will complete site specific emergency planning)

Emergency	Evacuation Route	Muster Location
Chemical Spill	Upwind	ET Vehicle/Nearby Storage Facilities
Fire/Explosion	•To be determined	ET Vehicle/Nearby Storage Facilities
Tornado	•To be determined	ET Vehicle/Nearby Storage Facilities
Lightning	•To be determined	ET Vehicle/Nearby Storage Facilities
Additional Information		
Communication Procedures	Two sounds to the air horn, stop work and proceed to muster location Emergencies dial 911 on cellular telephones or trailer telephones	
CPR/First Aid Trained Personnel	Lucas Benedict	
Site-Specific Spill Response Procedures	Spill Kit Available Onsite	

12.1.2 Site-Specific Emergency Procedures

Prior to the start of site operations, the EC shall fill in the following with any site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures:

12.1.3 Spill Containment Procedure

Work activities may involve the use of hazardous materials (i.e. fuels, solvents) or work involving drums or other containers. The following procedures will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers
- Tops/lids will be placed back on containers after use.
- Containers of hazardous materials will be stored appropriately away from moving equipment.

At least one spill response kit, to include an appropriate empty container, materials to allow for booming, or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e. speedy dri) shall be available at each work site (more as needed).

- All hazardous commodities in use (i.e. fuels) shall be properly labeled.
- Containers shall only be lifted using equipment specifically manufactured for that purpose.
- For drums/containers, follow the procedures in SH&E 405, *Handling of Drums and Large Containers*, to minimize spillage.

12.1.4 Accident/Incident Reporting

All accidents and incidents that occur on-site during any field activity will be promptly reported to the SSO and the Field Manager (FM) in accordance with Earth Tech Safety Procedure SH&E 101, *Injury, Illness, and Near-Miss Reporting*.

If any Earth Tech employee is injured and requires medical treatment, the FM will contact **Earth Tech's Incident Reporting Line at (800) 348-5046 immediately**. The FM will initiate a written report, using the ***Supervisor's Report of Incident*** form (see SH&E 101). The FM will complete the first two sections of this form and forward to the CTO Manager for completion of Section 3. The report will then be provided to the H&SP 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.

Table 12-2
Emergency Contacts

Emergency Coordinators / Key Personnel			
Name	**Title/Workstation**	**Telephone Number**	**Cell Phone**
Lt. Col. Ron Leadley	Schenectady ANG EM	518 344-2341	
Scott Underhill	Project Manager	518 951-2208	518 396-7638
Minda Murray	Project Safety Manager	518 951-2330	518 810-6488
Wil Lindhiemer	Site Superintendent	518 951-2302	
Lucas Benedict	Site Safety Officer	518 951-2236	518 810-6489
Robert Poll, CSP, CIH	District Safety Mgr/HSC	518 951-2200	518 817-3089
Incident Reporting	**Corporate Safety Administrator**	**800-348-5046**	
Chris Hunsicker	Emergency Coordinator (EC)	518 951-2209	518 429-1338

Organization / Agency	
Name	**Telephone Number**
Police Department	911 or 518 384-2244
Fire Department	911 or 518 374-7744
State Police	911 or 518 457-6721
Ambulance Service ***(EMT will determine appropriate hospital for treatment)***	911 or 518 374-4401
Hospital *(Use by site personnel is only for non-emergency cases)*	
ELLIS HOSPITAL 1101 N0TT STREET SCHENECTADY, NY 12308	518 243-4000
(Hospital Route Maps on following page)	
Hospital Route:	
Start: Depart 1 Air National Guard Road, Scotia, NY 12302 on SR-29 S (Maple Avenue) 1.3 miles. **1**: Turn LEFT (South) onto SR-50S [Freeman Bridge Rd] 1.1 mile **2:** Turn LEFT (East) onto Nott St 0.9 mile **End:** Arrive 1101 Nott St, Schenectady, NY 12308	
Poison Control Center	800-222-1222
Pollution Emergency	800-292-4706
National Response Center	800-424-8802
Chem-Trec	800-424-9300
SARA Title III Hotline	800-535-0202

Public Utilities	
Name	**Telephone Number**
Dig Safely New York	800-962-7962

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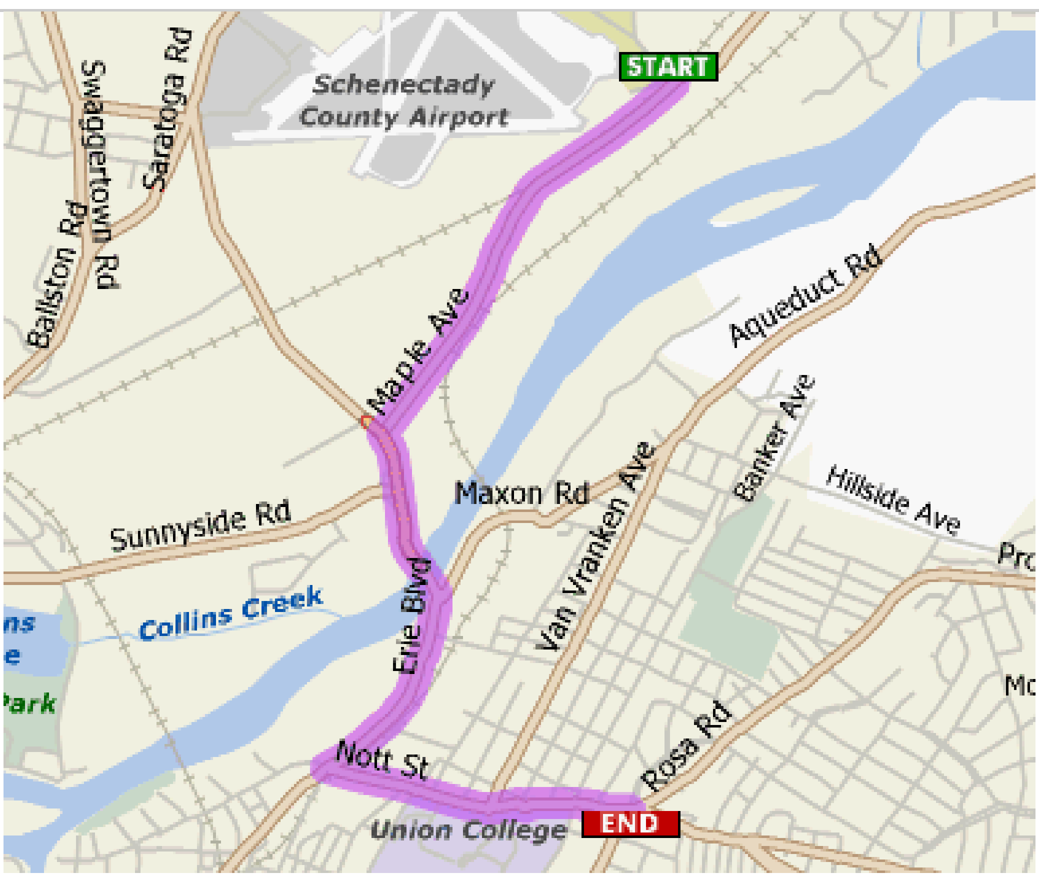
Figure 12-1
Hospital Route/Detail Map

Name: Ellis Hospital
Address: 1101 Nott Street

START	1:	Start out going SOUTHEAST on CR-14 / AIR NATIONAL GUARD RD toward MAPLE AVE / CR-29.	<0.1 miles
	2:	Turn RIGHT onto MAPLE AVE / CR-29.	1.3 miles
	3:	Turn LEFT onto FREEMAN BRIDGE RD / FREEMANS BRIDGE RD.	0.5 miles
	4:	FREEMAN BRIDGE RD / FREEMANS BRIDGE RD becomes ERIE BLVD.	0.6 miles
	5:	Turn SHARP LEFT onto NOTT ST.	0.8 miles
END	6:	End at **Ellis Hospital:** 1101 Nott St, Schenectady, NY 12308, US	

Total Est. Time: 7 minutes**Total Est. Distance:** 3.31 miles



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13.0 PERSONNEL ACKNOWLEDGEMENT

By signing below, the undersigned acknowledges that he/she has read and reviewed the Earth Tech Health and Safety Plan for the 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

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ATTACHMENT A
Material Safety Data Sheets

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Material Safety Data Sheet

Ammonium hydroxide water solution, >5.7N but < 14N NH4OH (>10% but <25% as ammonia, NH3)

ACC# 01260

Section 1 - Chemical Product and Company Identification

MSDS Name: Ammonium hydroxide water solution, >5.7N but < 14N NH4OH (>10% but <25% as ammonia, NH3)
Catalog Numbers: S70663MF, A470-1, A470-250, A470-500, A512-4, A512-500
Synonyms: Ammonium hydrate; Ammonia solution; Ammonia water; Aqueous ammonia; Aqua ammonia.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7732-18-5	Water	76-90	231-791-2
7664-41-7	Ammonia	10-24	231-635-3

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid.
Danger! Causes eye and skin burns. Causes digestive and respiratory tract burns. Harmful if swallowed.
Target Organs: Eyes, skin, mucous membranes.

Potential Health Effects

Eye: Contact with liquid or vapor causes severe burns and possible irreversible eye damage. Lachrymator (substance which increases the flow of tears).
Skin: Causes severe skin irritation. Causes skin burns. May cause deep, penetrating ulcers of the skin. Contact with the skin may cause staining, inflammation, and thickening of the skin.
Ingestion: Harmful if swallowed. May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. Causes throat constriction, vomiting, convulsions, and shock.
Inhalation: Effects may be delayed. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma.
Chronic: Prolonged inhalation may cause respiratory tract inflammation and lung damage. Prolonged or repeated exposure may cause corneal damage and the development of cataracts and glaucoma.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.

MATERIAL SAFETY DATA SHEET

EMULSIFIED EDIBLE OIL SUBSTRATE

----HMIS----	
HEALTH	1
FLAMMABILITY	0
REACTIVITY	0
PERSONAL PROTECTION	B

D.O.T. HAZARD CLASSIFICATION: NONE

MANUFACTURER'S NAME

EOS Remediation, Inc
3722 Benson Drive, Suite 101
Raleigh,NC 27609

DATE OF PREPARATION
01-24-03, Rev. 02-16-04

INFORMATION TELEPHONE NO.
919-873-2204

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME	**EOS®CONCENTRATE 1.1**
PRODUCT CLASS	**VEGETABLE OIL BASED EMULSION**
CAS NUMBER	**MIXTURE**

SECTION II - HAZARDOUS INGREDIENTS

COMPONENT(S)	EXPOSURE LIMIT

THIS PRODUCT IS A MIXTURE OF EDIBLE FOOD GRADE ADDITIVES AND CONTAINS NO HAZARDOUS INGREDIENTS.

SECTION III - PHYSICAL DATA

BOILING POINT:	**212°F**
SPECIFIC GRAVITY:	**.92**
VAPOR PRESSURE:	**NOT ESTABLISHED**
PERCENT VOLATILE BY VOLUME (%):	**24 (AS WATER)**
VAPOR DENSITY:	**HEAVIER THAN AIR**
EVAPORATION RATE:	**NOT ESTABLISHED**
SOLUBILITY IN WATER:	**SOLUBLE**
APPEARANCE AND ODOR:	**OFF WHITE LIQUID WITH VEGETABLE OIL ODOR**

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: **>300°F**
FLAMMABLE LIMITS: **NOT ESTABLISHED**
EXTINGUISHING MEDIA: **CO_2, FOAM, DRY CHEMICAL**
NOTE: WATER, FOG, AND FOAM MAY CAUSE FROTHING AND SPATTERING.

UNUSUAL FIRE AND EXPLOSION HAZARDS: **BURNING WILL CAUSE OXIDES OF CARBON.**

SPECIAL FIRE FIGHTING PROCEDURES: **WEAR SELF CONTAINED BREATHING APPARATUS AND CHEMICAL RESISTANT CLOTHING. USE WATER SPRAY TO COOL FIRE EXPOSED CONTAINERS.**

SECTION V - PHYSICAL HAZARDS

STABILITY: **STABLE**
CONDITIONS TO AVOID: **NONE**

INCOMPATIBILITY: **STRONG ACIDS AND OXIDIZERS.**

HAZARDOUS DECOMPOSITION PRODUCTS: **THERMAL DECOMPOSITION MAY PRODUCT OXIDES OF CARBON.**

HAZARDOUS POLYMERIZATION: **WILL NOT OCCUR**

SECTION VI - HEALTH HAZARDS

SIGNS AND SYMPTOMS OF EXPOSURE:
1. Acute Overexposure - **NONE**
2. Chronic Overexposure - **NONE**

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: **NONE KNOWN**

CHEMICAL LISTED AS CARCINOGEN OR POTENTIAL CARCINOGEN:
N.T.P. - **NO** I.A.R.C. - **NO** OSHA - **NO**

EMERGENCY AND FIRST AID PROCEDURES:
1.) Inhalation- **REMOVE TO FRESH AIR.**
2.) Eyes- **FLUSH WITH WATER FOR 15 MINUTES, IF IRRITATION PERSISTS SEE PHYSICIAN.**
3.) Skin- **WASH WITH MILD SOAP AND WATER.**
4.) Ingestion- **PRODUCT IS NON-TOXIC. IF NAUSEA OCCURS, INDUCE VOMITING AND SEEK MEDICAL ATTENTION.**

SECTION VII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:	**NOT NORMALLY REQUIRED**
VENTILATION:	**LOCAL EXHAUST**
PROTECTIVE GLOVES:	**NOT NORMALLY REQUIRED**
EYE PROTECTION:	**NOT NORMALLY REQUIRED**
OTHER PROTECTIVE CLOTHING OR EQUIPMENT:	**NONE**

SECTION VIII - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:	**DO NOT STORE NEAR EXCESSIVE HEAT OR OXIDIZERS.**
OTHER PRECAUTIONS:	**NONE**
STEPS TO BE TAKEN IN CASE MATERIAL IS SPILLED:	**SOAK UP WITH DRY ABSORBENT AND FLUSH AREA WITH LARGE AMOUNTS OF WATER.**
WASTE DISPOSAL METHODS:	**DISPOSE OF ACCORDING TO FEDERAL, STATE, AND LOCAL REGULATIONS.**

SECTION IX - ADDITIONAL REGULATORY INFORMATION

SARA TITLE III

UNDER THE PROVISIONS OF TITLE 111, SECTION 311/312 OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATIONS ACT, THIS PRODUCT IS CLASSIFIED INTO THE FOLLOWING HAZARD CATEGORIES: **NONE**

THIS PRODUCT DOES <u>NOT</u> CONTAIN SECTION 313 REPORTABLE INGREDIENTS.

THE INFORMATION CONTAINED HEREIN IS BASED ON AVAILABLE DATA AND IS BELIEVED TO BE CORRECT. HOWEVER, EOS REMEDIATION, INC. MAKES NO WARRANTY, EXPRESSED OR IMPLIED, REGARDING THE ACCURACY OF THIS DATA OR THE RESULTS TO BE OBTAINED THEREOF. THIS INFORMATION AND PRODUCT ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE HIS/HER OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR HIS/HER PARTICULAR PURPOSE.

Language: EN
Country:

**** MATERIAL SAFETY DATA SHEET ****

Trimethyl phosphate, 97%

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Trimethyl phosphate, 97%
Catalog Numbers:
15797-0000, 15797-0500, 15797-5000
Synonyms:
TMP
Company Identification (Europe): Acros Organics BVBA
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#	Haz Symbols	Risk Phrases
512-56-1	Trimethyl phosphate	97%	208-144-8		

Hazard Symbols: XN
Risk Phrases: 22 40

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW
Harmful if swallowed. Limited evidence of a carcinogenic effect.

Potential Health Effects
Eye:
May cause eye irritation.
Skin:
May cause skin irritation.
Ingestion:
Harmful if swallowed.
Inhalation:
May cause respiratory tract irritation. Prolonged exposure may result in dizziness and general weakness. The toxicological properties of this substance have not been fully investigated.
Chronic:
Chronic ingestion may cause neurological symptoms.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin:
Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion:
Get medical aid. Wash mouth out with water.
Inhalation:
Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician:

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Extinguishing Media:
Use water spray, dry chemical, carbon dioxide, or chemical foam.

**** 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. vermiculite, sand or earth), then place in suitable container.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Avoid breathing dust, vapor, mist, or gas. Avoid contact with skin and eyes. Use only in a chemical fume hood.

Storage:
Store in a cool, dry place. Store in a tightly closed container.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Use adequate ventilation to keep airborne concentrations low.

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Clear liquid
Color:	APHA: 30 max
Odor:	pleasant odor
pH:	Not available.
Vapor Pressure:	Not available.
Viscosity:	Not available.
Boiling Point:	197 deg C @ 760.00mm Hg
Freezing/Melting Point:	-46 deg C
Autoignition Temperature:	Not available.
Flash Point:	> 148 deg C (> 298.40 deg F)
Explosion Limits, lower:	Not available.
Explosion Limits, upper:	Not available.
Decomposition Temperature:	
Solubility in water:	500 MG/L (25?C) IN WATER
Specific Gravity/Density:	1.1970g/cm3
Molecular Formula:	(CH3O)3P(O)
Molecular Weight:	140.08

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.

Conditions to Avoid:
Incompatible materials.

Incompatibilities with Other Materials:
Strong bases, strong oxidizing agents.

Hazardous Decomposition Products:
Phosphine, carbon monoxide, oxides of phosphorus, carbon dioxide.

Hazardous Polymerization: Will not occur.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 512-56-1: TC8225000

LD50/LC50:
CAS# 512-56-1: Oral, mouse: LD50 = 1470 mg/kg; Oral, rabbit: LD50 = 1275 mg/kg; Oral, rat: LD50 = 840 mg/kg; Skin, rabbit: LD50 = 2830 uL/kg.

Carcinogenicity:
  Trimethyl phosphate -
    California: carcinogen; initial date 5/1/96
Other:
    See actual entry in RTECS for complete information.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Other
    No information available.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

**** SECTION 14 - TRANSPORT INFORMATION ****

IATA
    No information available.
IMO
    No information available.
RID/ADR
    No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

European/International Regulations
  European Labeling in Accordance with EC Directives
    Hazard Symbols: XN
    Risk Phrases:
        R 22 Harmful if swallowed.
        R 40 Limited evidence of a carcinogenic effect.
    Safety Phrases:
        S 36/37 Wear suitable protective clothing and gloves.
        S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
WGK (Water Danger/Protection)
    CAS# 512-56-1: 1
United Kingdom Occupational Exposure Limits

United Kingdom Maximum Exposure Limits

Canada
    CAS# 512-56-1 is listed on Canada's DSL List.
    CAS# 512-56-1 is listed on Canada's Ingredient Disclosure List.
Exposure Limits
    CAS# 512-56-1: OEL-FINLAND:TWA 0.05 ppm (2.6 mg/m3);STEL 10 ppm (52 mg/m3);Skin;Carcinogen
    OEL-GERMANY;Skin;Carcinogen
US FEDERAL
  TSCA
    CAS# 512-56-1 is listed on the TSCA inventory.

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 10/18/1996 Revision #0 Date: Original.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: After inhalation exposure, observe for 24 to 72 hours as pulmonary edema may be delayed.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Ammonium hydroxide itself is non-combustible. However concentrated ammonia solutions may give off ammonia vapours. Ammonia gas is generally not considered a serious fire or explosion hazard because ammonia/air mixtures are difficult to ignite. A relatively high concentration of ammonia gas must be present in order for ignition to occur. However, a large and intense energy source may cause ignition and/or explosion in a confined space.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: Not available.
Autoignition Temperature: 651 deg C (1,203.80 deg F)
Explosion Limits, Lower:15%
Upper: 28%
NFPA Rating: (estimated) Health: 3; Flammability: 1; Instability: 0

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. vermiculite, sand or earth), then place in suitable container. Neutralize spill with a weak acid such as vinegar or acetic acid. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation. Approach spill from upwind.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Discard contaminated shoes. Do not breathe vapor. Use only with adequate ventilation.
Storage: Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Isolate from oxidizing materials and acids. Walls, floors, shelving, fittings, lighting and ventilation systems in storage area should be made from carbon steel or stainless steel which do not react with ammonium hydroxide.

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. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Water	none listed	none listed	none listed
Ammonia	25 ppm TWA; 35 ppm STEL	25 ppm TWA; 18 mg/m3 TWA 300 ppm IDLH	50 ppm TWA; 35 mg/m3 TWA
Ammonium hydroxide	none listed	none listed	none listed

OSHA Vacated PELs: Water: No OSHA Vacated PELs are listed for this chemical. Ammonia: No OSHA Vacated PELs are listed for this chemical. Ammonium hydroxide: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear chemical splash goggles and face shield.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colorless
Odor: strong odor - ammonia-like
pH: 13.6
Vapor Pressure: > 112.5 mm Hg @ 20 deg C
Vapor Density: 0.59 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 27 deg C
Freezing/Melting Point:-34.9 deg C
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density:0.92
Molecular Formula:NH4OH
Molecular Weight:35.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures. Ammonium hydroxide is actually a solution of ammonia in water. Therefore the flammable properties of ammonia apply.
Conditions to Avoid: High temperatures, confined spaces, Ammonia solutions are corrosive to copper, zinc, aluminum and their alloys..
Incompatibilities with Other Materials: Strong oxidizing agents, acids, acrolein, halogens, mercury, hypochlorite, silver nitrate, acrylic acid, dimethyl sulfate, silver oxide.
Hazardous Decomposition Products: Nitrogen oxides (NOx) and ammonia (NH3).
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7732-18-5: ZC0110000
CAS# 7664-41-7: BO0875000
CAS# 1336-21-6: BQ9625000
LD50/LC50:
CAS# 7732-18-5:

Oral, rat: LD50 = >90 mL/kg;

.

CAS# 7664-41-7:

Inhalation, mouse: LC50 = 4230 ppm/1H;
Inhalation, mouse: LC50 = 4600 mg/m3/2H;
Inhalation, rabbit: LC50 = 7 gm/m3/1H;
Inhalation, rat: LC50 = 2000 ppm/4H;
Inhalation, rat: LC50 = 18600 mg/m3/5M;
Inhalation, rat: LC50 = 7040 mg/m3/30M;
Skin, rat: LD50 = 112000 mg/m3/15M;
Skin, rat: LD50 = 71900 mg/m3/30M;
Skin, rat: LD50 = 4840 mg/m3/60M;

.

CAS# 1336-21-6:

Draize test, rabbit, eye: 250 ug Severe;
Draize test, rabbit, eye: 44 ug Severe;
Oral, rat: LD50 = 350 mg/kg;

.

Carcinogenicity:
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7664-41-7: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 1336-21-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.008 mg/L; 24 Hr.; Unspecified
Fish: Fathead Minnow: LC50 = 8.2 mg/L; 96 Hr.; Unspecified
Fish: Bluegill/Sunfish: LC50 = 0.024-0.093 mg/L; 48 Hr.; Unspecified
Water flea Daphnia: EC50 =0.66 mg/L; 48 Hr.; 22 degrees C

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	**Canada TDG**
Shipping Name:	AMMONIA SOLUTIONS	AMMONIA SOLUTIONS
Hazard Class:	8	8(9.2)
UN Number:	UN2672	UN2672

Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7732-18-5 is listed on the TSCA inventory.
CAS# 7664-41-7 is listed on the TSCA inventory.
CAS# 1336-21-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 7664-41-7: 100 lb final RQ; 45.4 kg final RQ CAS# 1336-21-6: 1000 lb final RQ; 454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
CAS# 7664-41-7: 500 lb TPQ
SARA Codes
CAS # 1336-21-6: immediate, delayed.
Section 313
This material contains Ammonia (CAS# 7664-41-7, 10-24%),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.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 7664-41-7 is listed as a Hazardous Substance under the CWA. CAS# 1336-21-6 is listed as a Hazardous Substance 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:
CAS# 7664-41-7 is considered highly hazardous by OSHA.
STATE
CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 7664-41-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
CAS# 1336-21-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
C
Risk Phrases:
R 34 Causes burns.

Safety Phrases:
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
CAS# 7732-18-5: No information available.
CAS# 7664-41-7: 2
CAS# 1336-21-6: 2
Canada - DSL/NDSL
CAS# 7732-18-5 is listed on Canada's DSL List.
CAS# 7664-41-7 is listed on Canada's DSL List.
CAS# 1336-21-6 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D1B, E.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 7664-41-7 is listed on the Canadian Ingredient Disclosure List.
CAS# 1336-21-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/22/1999
Revision #9 Date: 1/26/2005

ATTACHMENT B
Equipment Safety Cards

SAFETY CARD

CIRCULAR SAW

Objective / Overview:

Among professionals, the circular saw is probably the most commonly used powered saw and perhaps the most commonly abused. Familiarity should not breed carelessness. Safe measures include proper training, good body mechanics and felling technique, well-maintained equipment, and protective equipment. The circular saw is used in cutting wood products, (i.e. plywood, construction lumber, etc.).

Safe Operating Guidelines:

Use sharp blades. Dull blades cause binding, stalling and possible kickback. Use the correct blade for the application and check for proper operation before each cut. Check often to ensure that guards return to their normal position quickly. Never defeat the guard to expose the blade. Before starting a circular saw, be sure the power cord and extension cords are out of the blade path and are long enough to freely complete the cut. A sudden jerk or pulling on the cord can cause loss of control of the saw and a serious accident. For maximum control, hold the saw firmly with both hands after securing the work piece. Check frequently to be sure clamps remain secure. Avoid cutting small pieces that can't be properly secured and material on which the saw shoe can't properly rest. When you start the saw, allow the blade to reach full speed before contacting the work piece.

Potential Hazards:

- Kickback – Sudden and violent reverse movement of the saw
- Hearing loss
- Flying debris
- Severe cuts

Training Requirements:

- Review of Applicable SOPs (ENV 504 & 531)
- Demonstrated knowledge on the use of a Circular saw
- Review and follow manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Leather Gloves
- Hearing Protection

Other Safety Tips:

- Circular saws are designed for right-hand operation; left-handed operation will demand more care to operate safely.
- Disconnect power supply before adjusting or changing the blade.
- Do not place hand under or in front of the shoe or guard of the saw when operating.
- Cut at the proper depth (1/4 in.) below work surface (see picture).

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SAFETY CARD

UTILITY KNIVES / RAZORS

Objective / Overview:
Utility knives serve a variety of purposes at worksites, and can be a useful tool, when used safely and correctly. Learning proper positioning and correctly using a utility knife will drastically reduce the potential of cut related injuries.

Safe Operating Guidelines:
Always be sure that knives are sharp and not dull. A dull blade will require more force to cut, increasing the likelihood of slipping. Be sure to blade is seated in the frame of the knife correctly, closed, and fastened together properly. Always keep body parts away from the cut line, (i.e., fingers), and ensure that the material being cut is on firm ground and not against a body part (cutting rope against your leg). Always pull the knife, never push the knife (the blade may break, and momentum could cause the body to come into contact with broken blade). Always retract the blade when not in use.

Potential Hazards:
- Lacerations from direct contact with the blade
- Lacerations from blade breaking or shattering
- Ergonomics

Training Requirements:
- Review of Applicable SOPs (ENV 506)
- Demonstrated knowledge on the safe use of a utility knives
- Review and follow manufacturers operating guidelines for specialized or unusual knives.

Personal Protective Equipment (Level D PPE) and:
- Cut resistant gloves (Kevlar, thick leather, etc.).

Other Safety Tips:
- Purchase safety equipped utility knives with guarding or automatically retracting blades
- Replace dull blades – When knife begins to tear rather than cut, it is a good indicator the blade is dull.
- Always wear a cut resistant glove on your free hand.
- Always use the right tool for the job – NEVER use the blade as a screwdriver or prying tool.
- When using a knife to cut thicker materials, use several passes. Increased force on the blade can cause it to stray from the intended cut path, or break the blade.
- When changing blades, always handle from the non-sharp side. Cover blade with duct tape and dispose.
- Use an alternate tool when possible (scissors, wire cutters, etc.)

Utility Knives with Gaurding

SAFETY CARD

WOOD CHIPPERS

Objective / Overview:

Wood chippers should be used with extreme caution in order to prevent personal injury, as the wood chipper is open to receive tree branches and other wooden material. Earth Tech only allows trained, authorized personnel to operate the wood chipper. Along with training, other safety measures include: reviewing the manufacturers instructional booklet, proper maintenance of equipment, and personal protective equipment.

Safe Operating Guidelines:

The operator must be completely familiar with the controls and proper use of the equipment. Workers feeding material into self-feeding wood chippers are at risk of being fed through the chipper if they reach or fall into the infeed hopper or become entangled in braches feeding into the machine. Prior to use make sure all safety devices and controls, such as emergency shut-off devices, are tested and verified to be functioning properly. Make sure two workers (buddy system) are in close contact with each other when operating the chipper.

Potential Hazards:

- Burns from contact with the hot muffler or engine
- Flying debris
- Noise exposure
- Inhaling exhaust fumes
- Entanglement in limbs and contact with chipper blades

Training Requirements:

- Review of Applicable SOPs (ENV 533)
- Demonstrated knowledge on the use of a wood chipper
- Review of manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Leather gloves
- Hearing protection
- Debris shield
- Long sleeve shirt (e.g. working near poison ivy, poison oak, etc.)

Other Safety Tips:

- Stand to the side of the chipper while inserting limbs into chipper, never stand directly in front
- Insert trunk portion of tree/limb first. This will prevent the branches from getting entangled with clothing, etc. and pulling you in with the tree/limb.
- Bystanders should be kept at least 25 feet away when in operation
- Keep the area around the wood chipper free of tripping hazards
- Never wear loose clothing that may get caught on feed material or moving parts
- Always set the trigger safety lock when the gun valve is not in use
- Never fill the fuel tank while the engine is running or if the engine is still hot

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SAFETY CARD

RECIPROCATING SAW

Objective / Overview:

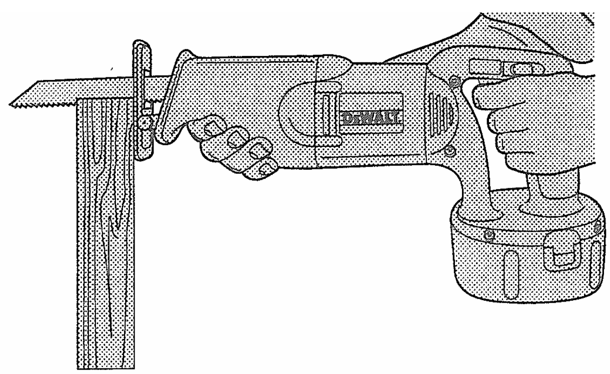
The versatility of the reciprocating saw, in cutting metal, pipe, wood and other materials have made it a widely used tool. By design, it is a simple tool to handle. Its demands for safe use, however, are very important.

Safe Operating Guidelines:

Use sharp blades. Dull blades can produce excessive heat, make sawing difficult, result in forcing the tool, and possibly cause an accident. Position yourself to maintain full control of the tool, and avoid cutting above shoulder height. To minimize blade flexing and provide a smooth cut, use the shortest blade that will do the job. The work piece must be clamped securely, and the shoe of the saw held firmly against the work to prevent operator injury and blade breakage. Maintain firm contact between the saw's shoe and the material being cut. When making a "blind" cut (you can't see behind what is being cut), be sure that hidden electrical wiring, or water pipes are not in the path of the cut. If wires are present, they must be disconnected at their power source by a qualified person or avoided, to prevent the possibility of lethal shock or fire. Water pipes must be drained and capped. Always hold the tool by the insulated grouping surfaces. When making anything other than a through cut, allow the tool to come to a complete stop before removing the blade from the work piece. This prevents breakage of the blade, and possible loss of tool control. Different work surfaces demand different blades.

Potential Hazards:

- Flying debris
- Hearing loss
- Cuts
- Hand / arm vibration syndrome



The correct way to hold the reciprocating saw while operating.

Training Requirements:

- Review of Applicable SOPs (ENV 504)
- Demonstrated knowledge on the use of a reciprocating saw
- Review and follow manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Leather Gloves/anti-vibration gloves
- Hearing protection

Other Safety Tips:

- Do not operate reciprocating saw in explosive atmospheres.
- Do not overreach. Keep proper footing and balance at all times.
- Do not use tool if switch is not operating correctly.
- Check for misalignment or binding of moving parts, breakage or parts and any other condition that may affect the tool’s operation.
- Always use two hands to operate saw (see picture).

SAFETY CARD

PRESSURE WASHERS

Objective / Overview:

High pressure washers can operate up to pressures of 5,000 psi and come in a variety of types ranging from gas operated to electrical. If not used correctly and safely, pressure washers can be a very dangerous piece of work equipment. Earth Tech only allows trained, authorized personnel to operate the high pressure washers. Along with training, other safety measures include: reviewing the manufacturers instructional booklet, proper maintenance of equipment, and personal protective equipment.

Safe Operating Guidelines:

The gun valve must always be pointed at the work area, NEVER point the gun valve at yourself or another person. High pressure washers shall be used to clean or decontaminate equipment, surfaces or structures only. High pressure washers WILL NOT be used to clean or decontaminate workers or personal protective equipment while it is being worn. Always set the tripper safety lock when the gun valve is not in use.

Potential Hazards:

- Kickback – Sudden and violent reverse movement of the gun
- Flying debris
- Slips and trips on wet surfaces and hoses
- Exhaust fumes/carbon monoxide (CO) in enclosed spaces
- Severe cuts

Training Requirements:

- Review of Applicable SOPs (ENV 526)
- Demonstrated knowledge on the use of a pressure washer
- Review of manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Hard hat with faceshield
- Heavy gloves
- Hearing protection
- PVC rain suit

Other Safety Tips:

- Never fill a pressure washer fuel tank with fuel while the engine is running or if the engine is still hot
- Non-operators must remain a minimum of 25 feet from the operator
- High pressure washing equipment should be cleaned often to avoid dirt buildup, especially around the trigger and guard area
- Always set the trigger safety lock when the gun valve is not in use
- Relieve the pressure in the system before coupling and uncoupling hoses
- Visually inspect the full length of high pressure discharge hose and inspect other high pressure fluid-handling components for abrasions or cuts, damage caused by exposure to chemicals and for damage caused by kinks in the hose

SAFETY CARD

POWER DRILL

Objective / Overview:

Available in a variety of types and capacities, portable power drills are undoubtedly the most used power tools. Because of their handiness and application to a wide range of jobs, drills often receive heavy use. For this reason, you'll need to carefully check your drill's capacity limitations and accessory recommendations.

Safe Operating Guidelines:

Check carefully for loose power cord connections and frays or damage to the cord. Replace damaged tool and extension cords immediately. Be sure the chuck is tightly secured to the spindle. This is especially important on reversible type drills. Tighten the bit securely as prescribed by the owner / operator's manual. The chuck key must be removed from the chuck before starting the drill. A flying key can be an injury-inflicting missile. Check auxiliary handles, if part of the tool. Be sure they are securely installed. Always use the auxiliary drill handle when provided. It gives you more control of the drill, especially if stalled conditions occur. Grasp the drill firmly by insulated surfaces. Always hold or brace the tool securely. Brace against stationary objects for maximum control. If drilling in a clockwise -- forward -- direction, brace the drill to prevent a counterclockwise reaction. Don't force a drill. Apply enough pressure to keep the drill bit cutting smoothly. If the drill slows down, relieve the pressure. Forcing the drill can cause the motor to overheat, damage the bit and reduce operator control.

Potential Hazards:

- Electrical shock
- Leaving chuck wrench in tool
- Puncture wounds
- Flying debris
- Severe cuts
- Fire
- Burns (hot bits)
- Sprains/strains (wrist)

Training Requirements:

- Review of Applicable SOPs (ENV 504)
- Demonstrated knowledge on the use of a power drill
- Review and follow manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Leather Gloves

Other Safety Tips:

- Electric drills must be double-insulated or plugged into a GFCI outlet.
- Never carry tool by cord or yank it to disconnect from receptacle.
- Keep cord away from sharp edges.

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SAFETY CARD

GENERATOR

Objective / Overview:

Portable generators should be used with extreme caution in order to prevent personal injury. When using a portable generator it's important to follow the manufacturer's instructions to avoid injuring someone or damaging your generator or appliances. Allow only trained, authorized personnel to operate the generator. Along with training, other safety measures include: proper maintenance of equipment and personal protective equipment.

Safe Operating Guidelines:

Follow manufacturer's recommended operating instructions, every generator is not the same. Maintain adequate ventilation. Generators emit carbon monoxide (CO). Never operate a generator in an enclosed building without proper ventilation. Turn the generator off to refuel. Gasoline and its vapors may ignite if they come into contact with hot components or an electrical spark, store fuel in a properly designed container in a secure location. To avoid a shock, make sure that your hands are dry and you're standing in a dry place whenever you operate the generator. Turn off equipment and lights supplied by the generator until it is running. Use the right extension cord. Use only UL-listed, three-prong extension cords. Be sure the extension cord is the proper size (wire-gauge) to handle the electric load that will be plugged into it. Make sure the generator is properly grounded prior to each use. If you intend on using a portable generator to tie into the wiring of an existing structure this shall be done only by a licensed electrician.

Potential Hazards:

- Burns from contact with the hot muffler or engine
- Shocks/electrocution
- Noise exposure
- Inhaling exhaust gases, CO

Training Requirements:

- Review of Applicable SOPs
- Demonstrated knowledge on the use of a generator
- Review of manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Leather Gloves
- Hearing Protection
- Long Sleeve Shirt (i.e. to shield from burns, etc.)

Other Safety Tips:

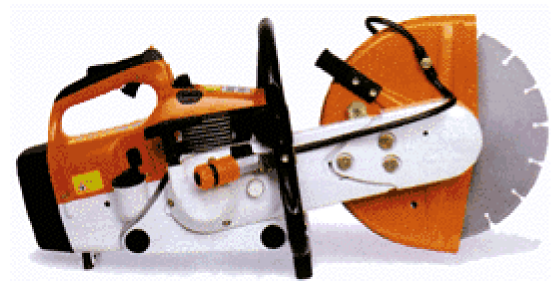
- Have a fire extinguisher readily available at all times.

SAFETY CARD

CUT OFF SAWS

Objective / Overview:

Cut-off saws are high-speed cutting tools and very dangerous to operate. Therefore, it is very important to review the general safety rules, training, PPE and procedures for working with portable cut off saws. Cut off saws are used in a variety of activities (i.e. concrete, piping, metal, etc.).



Safe Operating Guidelines:

Start the saw on firm ground or other solid surface in an open area. Never attempt to drop-start the engine. Clear the working area. Avoid operating the saw if the terrain is wet and/or frozen. Hold the saw firmly with both hands when the engine is running. Begin cutting at full throttle and continue at full throttle until the cut is finished. Avoid standing in a direct line with the cutting wheel. Use only downward pressure on the saw, as lateral pressure may cause the blade to break and shatter. Do not change the direction of the cut once started, as this can also cause the blade to break and shatter. Do not use abrasive-type wheels for rough grinding. Do not cut above shoulder height. Shut off the engine and remove the spark plug wire before adjusting or working on the saw. Carry the saw with engine stopped, muffler away from your body, while protecting the cutting wheel from striking the ground or other objects.

Potential Hazards:

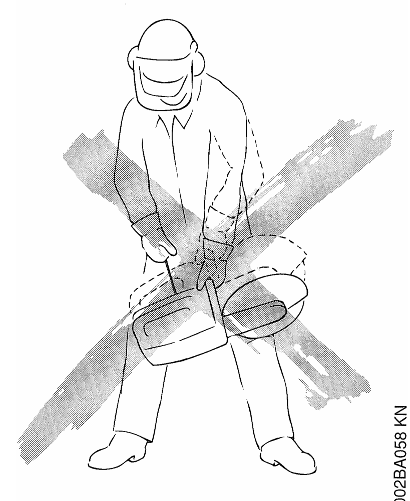
- Kickback – Sudden and violent reverse movement of the saw
- Hearing loss
- Flying debris
- Severe cuts
- Burns from engine
- Fire Hazard from sparks and gasoline
- Hand / arm vibration syndrome

Training Requirements:

- Review of Applicable SOPs (ENV 504)
- Demonstrated knowledge on the use of a cut off saw
- Review and follow manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Leather gloves
- Hearing protection: earplugs and/or earmuffs
- Face shield
- Respirator if required (concrete operations)



Never drop-start saw

Other Safety Tips:

- Keep flammable and combustible materials away from saw while cutting metal.
- Make sure the fuel cap is properly secured.
- Inspect the abrasive wheel for cracks and chips. If cracked or chip replace wheel before use.
- Ensure guard is positioned properly prior to start-up.
- Never try to drop-start the engine (see picture).

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SAFETY CARD

WOOD CHIPPERS

Objective / Overview:

Wood chippers should be used with extreme caution in order to prevent personal injury, as the wood chipper is open to receive tree branches and other wooden material. Earth Tech only allows trained, authorized personnel to operate the wood chipper. Along with training, other safety measures include: reviewing the manufacturers instructional booklet, proper maintenance of equipment, and personal protective equipment.

Safe Operating Guidelines:

The operator must be completely familiar with the controls and proper use of the equipment. Workers feeding material into self-feeding wood chippers are at risk of being fed through the chipper if they reach or fall into the infeed hopper or become entangled in braches feeding into the machine. Prior to use make sure all safety devices and controls, such as emergency shut-off devices, are tested and verified to be functioning properly. Make sure two workers (buddy system) are in close contact with each other when operating the chipper.

Potential Hazards:

- Burns from contact with the hot muffler or engine
- Flying debris
- Noise exposure
- Inhaling exhaust fumes
- Entanglement in limbs and contact with chipper blades

Training Requirements:

- Review of Applicable SOPs (ENV 533)
- Demonstrated knowledge on the use of a wood chipper
- Review of manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Leather gloves
- Hearing protection
- Debris shield
- Long sleeve shirt (e.g. working near poison ivy, poison oak, etc.)

Other Safety Tips:

- Stand to the side of the chipper while inserting limbs into chipper, never stand directly in front
- Insert trunk portion of tree/limb first. This will prevent the branches from getting entangled with clothing, etc. and pulling you in with the tree/limb.
- Bystanders should be kept at least 25 feet away when in operation
- Keep the area around the wood chipper free of tripping hazards
- Never wear loose clothing that may get caught on feed material or moving parts
- Always set the trigger safety lock when the gun valve is not in use
- Never fill the fuel tank while the engine is running or if the engine is still hot

ATTACHMENT C
Task Hazard Analyses

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EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION

Job/Task Name: **MOBILIZATION/DEMOBILIZATION –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

Mobilization/demobilization activities typically present limited hazards as compared to the majority of site tasks. However, the potential still exists for exposures to a variety of hazards, typically physical in nature.

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*): No Chemical Hazards

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

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

General:
- ☐ Coveralls ____________(*type*)
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☐ 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 (ANSI)
- ☐ Welder's helmet/goggles

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

Other (*List*):____

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Metal Detectors

ADMINISTRATIVE INFORMATION	
Job/Task Name: **MOBILIZATION/DEMOBILIZATION –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
APPLICABLE SOPS (SEE HASP/SSHP/APP)	**TRAINING REQUIREMENTS**
• Hearing Conservation (SH&E 109) • Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Fall Protection Program (SH&E 120) • Electrical Safety Program (SH&E 121) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Safety Rules (SH&E 201) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Hazardous Waste Operations (SH&E 301) • Demolition Operations (SH&E 305) • Overhead Electrical Lines (SHE 310) • Manual Lifting (SH&E 404) • Ladders (SH&E 501) • Powered Hand Tools (SH&E 505) • Manual Hand Tools (SH&E 506) • Fire Extinguishers (SH&E 508) • Heavy Equipment (SH&E 513) • Vehicle Traffic (SH&E 517) • Decontamination (SH&E 604) • Flammable & Combustible Materials (SH&E 606)	• Review site specific Health and Safety Plan, THA, and sign off.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **MOBILIZATION/DEMOBILIZATION –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

1. NED 002, Protection from Ticks
2. Evaluate surrounding work area for additional hazards that may be present.
3. Identify areas of poison ivy prior to beginning cutting operations.
4. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.

MONITORING PROCEDURES

No occupational Exposure Monitoring required. Non-HAZWOPER work.

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **MOBILIZATION/DEMOBILIZATION –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

ADMINISTRATIVE INFORMATION	
Job/Task Name: **GENERAL LABOR ACTIVITIES –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

Laborer personnel will assist in the performance of the above work activities, as well as other general site management tasks as assigned.

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*): No Chemical Hazards

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

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

General:
- ☐ Coveralls ____________(*type*)
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☐ 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 (ANSI)
- ☐ Welder's helmet/goggles

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

Other (*List*):______________________________

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):______________________________

INSPECT/PERMIT REQUIREMENTS	**EQUIPMENT TO BE USED**
None	Metal Detectors

ADMINISTRATIVE INFORMATION	
Job/Task Name: **GENERAL LABOR ACTIVITIES –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
APPLICABLE SOPs (SEE HASP/SSHP/APP)	**TRAINING REQUIREMENTS**
• Personal Protective equipment (SH&E 113) • Slips, Trips, Falls, and Protruding Objects (SH&E 210) • General Safety Rules (SH&E 201)	• Review site specific Health and Safety Plan, THA, and sign off.

ADDITIONAL SAFETY CONSIDERATIONS
5. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Inspects 6. Evaluate surrounding work area for additional hazards that may be present. 7. Identify areas of poison ivy prior to beginning cutting operations. 8. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
MONITORING PROCEDURES
No occupational Exposure Monitoring required. Non-HAZWOPER work.

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **GENERAL LABOR ACTIVITIES –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

ADMINISTRATIVE INFORMATION	
Job/Task Name: **UTILITY CLEARANCE AND IDENTIFICATION –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech and UFPO/DIGSAFE	Job Supervisor: TBD

JOB DESCRIPTION

Locations of all utilities will be marked out by an independent company (UFPO/DIGSAFELY) and Base Personnel. When all utility locations have been identified Earth Tech and the Base Environmental Manager will review the locations and determine if any utilities will be in conflict with the proposed construction plans. If any utility conflicts are identified, Earth Tech and the Base Environmental Manager will discuss what actions will need to be taken.

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

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

PHYSICAL HAZARDS

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

Other Chemical/Physical Hazards (*List*): No Chemical Hazards

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

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

General:
- ☐ Coveralls ____________(*type*)
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☐ 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 (ANSI)
- ☐ Welder's helmet/goggles

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

Other (*List*):______________________________

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):______________________________

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Metal Detectors

ADMINISTRATIVE INFORMATION	
Job/Task Name: **UTILITY CLEARANCE AND IDENTIFICATION –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech and UFPO/DIGSAFE	Job Supervisor: TBD

APPLICABLE SOPS (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
• Personal Protective equipment (SH&E 113) • Slips, Trips, Falls, and Protruding Objects (SH&E 210) • Clearing and Grubbing (SH&E 401) • Manual Lifting (SH&E 404)	• Review site specific Health and Safety Plan, THA, and sign off.

ADDITIONAL SAFETY CONSIDERATIONS

9. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Inspects
10. Evaluate surrounding work area for additional hazards that may be present.
11. Identify areas of poison ivy prior to beginning cutting operations.
12. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.

MONITORING PROCEDURES

No occupational Exposure Monitoring required. Non-HAZWOPER work.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **UTILITY CLEARANCE AND IDENTIFICATION –NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech and UFPO/DIGSAFE	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

EarthTech
A Tyco International Ltd. Company

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALL EROSION AND SEDIMENT CONTROLS – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

Earth Tech will install silt fence, hay bales, geotextile material, and/or other erosion control devices as specified in the contract plans. The sediment and erosion controls will be inspected on a regular basis during construction activities and repaired immediately if damage is observed until a final vegetated surface cover has been established in all areas. Surplus of silt fence will be kept on-site for additional controls or to repair damaged areas.

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
- ☒ Pinch and crushing hazards
- ☐ Ionizing radiation
- ☒ Eye hazards (impact, flying debris, 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*): No Chemical Hazards

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

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

General:
- ☐ Coveralls ____________(*type*)
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ 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 (ANSI)
- ☐ Welder's helmet/goggles

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

Other (*List*): **Leg protection if clearing and grubbing is necessary**

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy equipment (i.e backhoe, trenchers,)
	Sledge hammers
	Utility knife
	Picks and shovels

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALL EROSION AND SEDIMENT CONTROLS – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

APPLICABLE SOPS (SEE HASP/SSHP/APP)	**TRAINING REQUIREMENTS**
• Hearing Conservation (SH&E 109) • Personal Protective Equipment (SH&E 113) • Slips, Trips, Falls, and Protruding Objects (SH&E 210) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Clearing and Grubbing (SH&E 401) • Manual Lifting (SH&E 404) • Powered hand tools (SH&E 505) • Manual hand tools (SH&E 506) • Fire Extinguishers (SH&E 508) • Heavy Equipment (SH&E 513)	• Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADDITIONAL SAFETY CONSIDERATIONS

1. A *Heavy Equipment Inspection Form* will be completed for each piece of heavy equipment before it is put into operation on site. It is anticipated that the following heavy equipment will be utilized; backhoe, excavator, loader with forks, skid steer.
2. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Inspects
3. Evaluate surrounding work area for additional hazards that may be present.
4. Identify areas of poison ivy prior to beginning cutting operations.
5. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
6. Keep fire extinguisher in work area and within heavy equipment.
7. Do not fuel power equipment while engines/motors are hot.

MONITORING PROCEDURES

No occupational Exposure Monitoring required. Non-HAZWOPER work.

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALL EROSION AND SEDIMENT CONTROLS – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION

Job/Task Name: **CLEARING AND REMOVING VEGETATION AND STRUCTURES**

Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

Earth Tech will remove existing vegetation, any surface structures, and other obstructions from the site as needed during site preparation activities. Removal will be performed with a combination of backhoe and an excavator, skid steer with brush hog attachment and chainsaws.

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
- ☒ Pinch and crushing hazards
- ☐ Ionizing radiation
- ☒ Eye hazards (impact, flying debris, 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*): ______

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

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

General:
- ☐ Coveralls ______(*type*)
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ 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 (ANSI)
- ☐ Welder's helmet/goggles

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

Other (*List*): Leg protection (i.e. leather chaps)

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*): ______

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy equipment (i.e backhoe, excavator, hammer attachment, skid steer, brush hog)
	Chipper
	Sledge hammers
	Utility knife
	Picks and shovels
	Chain saw

ADMINISTRATIVE INFORMATION

Job/Task Name: **CLEARING AND REMOVING VEGETATION AND STRUCTURES**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

APPLICABLE SOPS (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
• Hearing Conservation (SH&E 109) • Personal Protective Equipment (SH&E 113) • Ergonomics Program (SH&E 123) • General House Keeping, Hygiene, and Sanitation (SH&E 208) • Slips, Trips, Falls, and Protruding Objects (SH&E 210) • Demolition Operations (SH&E 305) • Clearing and Grubbing (SH&E 401) • Heavy Equipment (SH&E 513) • Powered Hand Tools (SH&E 505) • Manual Hand Tools (SH&E 506) • Fire Extinguishers (SH&E 508) • Traffic Safety (SH&E 517))	• Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate equipment. • Review Earth Tech Safety Cards where applicable

ADDITIONAL SAFETY CONSIDERATIONS

1. A *Heavy Equipment Inspection Form* will be completed for each piece of heavy equipment before it is put into operation on site. It is anticipated that the following heavy equipment will be utilized; backhoe, excavator (possible hammer attachment), loader with forks, skid steer, chipper)
2. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
3. Identify areas of poison ivy prior to beginning cutting operations.
4. Keep fire extinguisher within work area and within heavy equipment
5. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Inspects
6. Do not fuel power equipment while engines/motors are hot.

MONITORING PROCEDURES

No occupational Exposure Monitoring required. Non-HAZWOPER work.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **CLEARING AND REMOVING VEGETATION AND STRUCTURES**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION

Job/Task Name: **INSTALL FENCING – NON HAZWOPER**

Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☒ Routine job/task
Responsible Organization: Earth Tech and potential subcontractor	Job Supervisor: TBD

JOB DESCRIPTION

Earth Tech will install temporary and permanent chain link fence, barriers, locked gates, signage, and warning tape, to secure all work areas.

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
- ☒ Pinch and crushing hazards
- ☐ Ionizing radiation
- ☒ Eye hazards (impact, flying debris, 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*):

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

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

General:
- ☐ Coveralls ____________(*type*)
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ 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 (ANSI)
- ☐ Welder's helmet/goggles

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

Other (*List*):

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy equipment (i.e backhoe, excavator, skid steer,)
	Utility knife
	Shovels and rakes
	Post hole digger
	Post pounder

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALL FENCING – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☒ Routine job/task
Responsible Organization: Earth Tech and potential subcontractor	Job Supervisor: TBD

APPLICABLE SOPs (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
• Hearing Conservation (SH&E 109) • Personal Protective Equipment (SH&E 113) • Ergonomics Program (SH&E 123) • General House Keeping, Hygiene, and Sanitation (SH&E 208) • Slips, Trips, Falls, and Protruding Objects (SH&E 210) • Clearing and Grubbing (SH&E 401) • Heavy Equipment (SH&E 513) • Powered Hand Tools (SH&E 505) • Manual Hand Tools (SH&E 506) • Traffic Safety (SH&E 517)	• Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate equipment. • Review Earth Tech Safety Cards where applicable.

ADDITIONAL SAFETY CONSIDERATIONS

1. A *Heavy Equipment Inspection Form* will be completed for each piece of heavy equipment before it is put into operation on site. It is anticipated that the following heavy equipment will be utilized; backhoe, skid steer)
2. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
3. Identify areas of poison ivy prior to beginning cutting operations.
4. Keep fire extinguisher within work area and within heavy equipment.
5. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Inspects
6. Do not fuel power equipment while engines/motors are hot.
7. Confirm location of underground utilities prior to driving permanent fence posts

MONITORING PROCEDURES

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALL FENCING – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☒ Routine job/task
Responsible Organization: Earth Tech and potential subcontractor	Job Supervisor: TBD

No occupational Exposure Monitoring required. Non-HAZWOPER work.

ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALL FENCING – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☒ One time ☒ Routine job/task
Responsible Organization: Earth Tech and potential subcontractor	Job Supervisor: TBD

ADMINISTRATIVE INFORMATION	
Job/Task Name: **SURVEYING – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Subcontractor	Job Supervisor: TBD

JOB DESCRIPTION

An independent New York State registered professional surveyor will complete a pre-excavation survey to verify and stake out excavation limits of individual areas and to perform general site layout. The surveyor will also confirm elevations of final excavation depths.

CHEMICAL HAZARDS (*SELECT*) ☐ INH ☐ ING ☒ SKIN CONT.		PHYSICAL HAZARDS	
☐ Asbestos	☐ Bunker fuel/oil	☐ Electricity/High voltage	☐ Ionizing radiation
☐ Acids	☐ Explosives (TNT)	☐ Elevated work areas (fall hazard)	☒ Eye hazards (impact, flying debris, light, etc.)
☐ Caustics	☐ Dust	☒ Manual materials handling/Back	☒ Slips, trips, and falls
☐ Chlorinated hydrocarbons (TCE)	☐ Dioxins	☐ OE/UXO	☒ Hazardous noise
☐ Lead	☐ Pesticides/Herbicides	☒ Hand tool usage	☒ Heat or cold stress
☐ Gasoline or diesel fuel	☐ MTBE	☐ Power tool usage	☐ Oxygen-deficient atmosphere
☐ BTEX	☐ Methylene chloride	☐ Heavy equipment operations	☐ Oxygen-enriched atmosphere
☐ Jet fuel (JP-4, JP-5, JP-8)	☐ Waste oil	☐ Drill rig (HSA, DP, Air Rotary)	☐ Explosive atmosphere
☐ PCBs	☐ Hydraulic fluid	☐ Excavations (engulfment/collapse)	☐ Powder-actuated tools
☐ Cadmium	☐ Petroleum hydrocarbons	☐ Confined space entry	☒ Vehicular traffic
☐ Compressed gases/asphyxiants		☐ Pinch and crushing hazards	
☐ PAHs			
☐ Welding fumes			
☐ Hydrogen sulfide			
☐ Other metals			

Other Chemical/Physical Hazards (*List*): No chemical hazards

Biological hazards (i.e. insect bits), poisonous plant contact)

Administrative Information

Job/Task Name: **SURVEYING – NON HAZWOPER**

Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Subcontractor	Job Supervisor: TBD

Personal Protective Equipment (PPE) Required

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

General:
- ☐ Coveralls ____________(*type*)
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ 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 (ANSI)
- ☐ Welder's helmet/goggles

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

Other (*List*):______________________________

Other Safety Equipment/Considerations

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

Other (*List*):______________________________

Inspect/Permit Requirements	Equipment to be Used
None	None

Applicable SOPs (See HASP/SSHP/APP)	Training Requirements
• Personal Protective Equipment (SH&E 113) • Ergonomics Program (SH&E 123) • General House Keeping, Hygiene, and Sanitation (SH&E 208) • Slips, Trips, Falls, and Protruding Objects (SH&E 210)	• Review site specific Health and Safety Plan, THA, and sign off. • Review Earth Tech Safety Cards where applicable.

Additional Safety Considerations

1. Potential for eye injury if lasers are to be used. Review manufactures safety procedures for lasers prior to use.
2. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Inspects

Monitoring Procedures

EarthTech
A Tyco International Ltd. Company

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **SURVEYING – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Subcontractor	Job Supervisor: TBD
No occupational Exposure Monitoring required. Non-HAZWOPER work.	

ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

ADMINISTRATIVE INFORMATION	
Job/Task Name: **SURVEYING – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Subcontractor	Job Supervisor: TBD

ADMINISTRATIVE INFORMATION	
Job/Task Name: **TRAFFIC CONTROL – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

Earth Tech will implement a traffic control strategy for material transport trucks entering and leaving the site. Earth Tech will utilize temporary traffic work signs, barricades, and cones to divert traffic away from entrance of job site or to close road completely.

CHEMICAL HAZARDS (*SELECT*) ☐ INH ☐ ING ☒ SKIN CONT.		PHYSICAL HAZARDS	
☐ Asbestos	☐ Bunker fuel/oil	☐ Electricity/High voltage	☐ Ionizing radiation
☐ Acids	☐ Explosives (TNT)	☐ Elevated work areas (fall hazard)	☒ Eye hazards (impact, flying debris, light, etc.)
☐ Caustics	☐ Dust	☒ Manual materials handling/Back	☒ Slips, trips, and falls
☐ Chlorinated hydrocarbons (TCE)	☐ Dioxins	☐ OE/UXO	☒ Hazardous noise
☐ Lead	☐ Pesticides/Herbicides	☒ Hand tool usage	☒ Heat or cold stress
☐ Gasoline or diesel fuel	☐ MTBE	☐ Power tool usage	☐ Oxygen-deficient atmosphere
☐ BTEX	☐ Methylene chloride	☒ Heavy equipment operations	☐ Oxygen-enriched atmosphere
☐ Jet fuel (JP-4, JP-5, JP-8)	☐ Waste oil	☐ Drill rig (HSA, DP, Air Rotary)	☐ Explosive atmosphere
☐ PCBs	☐ Hydraulic fluid	☐ Excavations (engulfment/collapse)	☐ Powder-actuated tools
☐ Cadmium	☐ Petroleum hydrocarbons	☐ Confined space entry	☒ Vehicular traffic
☐ Compressed gases/asphyxiants		☒ Pinch and crushing hazards	

ADMINISTRATIVE INFORMATION

Job/Task Name: **TRAFFIC CONTROL – NON HAZWOPER**

Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

☐ PAHs
☐ Welding fumes
☐ Hydrogen sulfide
☐ Other metals

Other Chemical/Physical Hazards (*List*): No chemical hazards

Biological hazards (i.e. insect bits),

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

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

General:
☐ Coveralls ____________(*type*)
☒ Full Length Pants
☒ Reflective Safety Vest
☒ 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 (ANSI)
☐ Welder's helmet/goggles

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

Other (*List*):

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy Equipment (i.e. backhoe, skid steer)

APPLICABLE SOPS (SEE HASP/SSHP/APP)

- Hearing Conservation (SH&E 109)
- Personal Protective Equipment (SH&E 113)
- Ergonomics Program (SH&E 123)
- General House Keeping, Hygiene, and Sanitation (SH&E 208)
- Slips, Trips, Falls, and Protruding Objects (SH&E 210)
- Manual Lifting (SH&E 404)
- Heavy Equipment (SH&E 513)
- Traffic Safety (SH&E 517)

TRAINING REQUIREMENTS

- Review site specific Health and Safety Plan, THA, and sign off.
- Approved and experience heavy equipment operators will be allowed to operate equipment.
- Review Earth Tech Safety Cards where applicable.

ADDITIONAL SAFETY CONSIDERATIONS

EarthTech
A Tyco International Ltd. Company

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **TRAFFIC CONTROL – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

1. A *Heavy Equipment Inspection Form* will be completed for each piece of heavy equipment before it is put into operation on site.
2. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
3. Keep fire extinguisher within work area and within heavy equipment.
4. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Inspects
5. Do not fuel power equipment while engines/motors are hot.

MONITORING PROCEDURES

No occupational Exposure Monitoring required. Non-HAZWOPER work.

ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

ADMINISTRATIVE INFORMATION	
Job/Task Name: **TRAFFIC CONTROL – NON HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Site Preparation	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADMINISTRATIVE INFORMATION

Job/Task Name: **EXCAVATION OF CONTAMINATED SOILS AND SEDIMENTS - HAZWOPER**

Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

In accordance with the final work plan, excavations will be performed at the Base at Site 3, Site 6, and the swale south and east of these areas. Excavation depth is to a maximum of one (1) foot below groundwater. Earth Tech has assumed an excavation depth of approximately 7 feet at both Site 3 and Site 6. Earth Tech has calculated that approximately 2,000 cubic yards of soils and sediments will be excavated during these operations.

If underground obstructions or debris is encountered, Earth Tech will remove and stage large debris on-site. Debris will be staged n a roll-off container(s) or if the material is suitable, Earth Tech will process material into a size that the thermal treatment facility can accept.

The excavation crew will utilize a CAT 330 or equivalent excavator to perform excavations. Run-off and run-on will be controlled using soil berms, hay bails, and other soil erosion control measures. Any water accumulating in open excavations will be pumped to containers and held onsite pending analytical results.

The excavated contaminated soil will be stockpiled for offsite disposal. The transport trucks will remain clean while being loaded with impacted material thereby decreasing the amount of decontamination required before exiting the site. Polyethylene sheeting will be used around the transport vehicles while being loaded, to prevent impacted material from spilling onto the clean haul road. Trucks will be covered with tarps after loading and then proceed to the decontamination pad. Prior to leaving the site, all transport vehicles will be inspected and decontaminated, if required, at the main decontamination pad.

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 (Arsenic)
☐ 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/Trenches (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*): ______

Biological hazards (i.e. insect bits), poisonous plant contact)

______

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
☒ Rubber or Tyvex (ANSI safety-toe)
☒ Leather (ANSI safety-toe)

General:
☒ Coveralls Tyvex
☒ Full Length Pants
☒ Reflective Safety Vest
☒ Hearing protection (plugs/muffs)
☒ FF APR Combo Dust & VOC
☒ ½-face APR Combo Dust & VOC (equipment operators ONLY)
☒ Safety harness & lanyard
☒ ANSI-approved Hard hat

Eye Protection:
☐ Faceshield
☒ Safety glasses or goggles (ANSI)
☐ Welder's helmet/goggles

Gloves:
☒ Chemically-protective Latex and/or Nitrile
☒ Leather/cloth
☐ Welder's
☐ Electrical safety ________(*volts*)

Other (*List*): ______

______

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*): ______

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy equipment, shovels, lifting straps, cables, chains, ladder, and generator

ADMINISTRATIVE INFORMATION	
Job/Task Name: **EXCAVATION OF CONTAMINATED SOILS AND SEDIMENTS - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

APPLICABLE SOPs (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
• Hearing Conservation (SH&E 109) • Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Fall Protection Program (SH&E 120) • Electrical Safety Program (SH&E 121) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • Competent Person (SH&E 132) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Hazardous Waste Operations (SH&E 301) • Demolition Operations (SH&E 305) • Overhead Electrical Lines (SHE 310) • Excavation and Trenching (SH&E 402) • Manual Lifting (SH&E 404) • Ladders (SH&E 501) • Powered Hand Tools (SH&E 505) • Manual Hand Tools (SH&E 506) • Fire Extinguishers (SH&E 508) • High Pressure Washers (SH&E 510) • Heavy Equipment (SH&E 513) • Decontamination (SH&E 604) • Flammable & Combustible Materials (SH&E 606)	• HAZWOPER 40 hour and current 8 hr refresher certification if needed. • Respirator and Hearing Conservation Training • Excavation and Trenching Awareness Training • Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **EXCAVATION OF CONTAMINATED SOILS AND SEDIMENTS - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

1. A *Heavy Equipment Inspection Form* will be completed for each piece of heavy equipment before it is put into operation on site. It is anticipated that the following heavy equipment will be utilized; backhoe, excavator, and loader)
2. An *Excavation Daily Inspection Checklist* will be completed on the days trenching and excavation activities are accruing.
3. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Insects
4. Earth Tech (Northeast) Injury Alert June 2006 Chop Saw Injury
5. Evaluate surrounding work area for additional hazards that may be present.
6. Identify areas of poison ivy prior to beginning cutting operations.
7. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
8. Keep fire extinguisher in work area and within heavy equipment.
9. Do not fuel power equipment while engines/motors are hot.

MONITORING PROCEDURES

ADMINISTRATIVE INFORMATION	
Job/Task Name: **EXCAVATION OF CONTAMINATED SOILS AND SEDIMENTS - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

PARAMETER	MONITORING INTERVAL	RESPONSE LEVEL (above background)	RESPONSE
VOCs	Every 30 minutes during excavation activities	< 10 units	Continue work in Modified Level D and continue monitoring.
		10 – 20 units (Sustained for more than 5 minutes)	Monitor for benzene. Continue work in Modified Level D unless benzene is present above 1.0 ppm, and continue monitoring.
		20 – 50 units (Sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge), and continue monitoring.
		> 50 units (Sustained for more than 5 minutes)	Cease work.
Benzene (By Colorimetric Tube)	30-minute intervals where indicted by VOC readings	< 1.0 ppm (No color change)	Continue work in Modified Level D and continue monitoring.
		> 1.0 ppm	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge).
Airborne Particulates (by miniRam)	Every 30 minutes when soil handling is occurring	<3 mg/m^3	Continue work in Modified Level D and continue monitoring.
		3 – 15 mg/m^3	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (N100 cartridge).
		> 15 mg/m^3	Cease work.

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ADMINISTRATIVE INFORMATION	
Job/Task Name: **EXCAVATION OF CONTAMINATED SOILS AND SEDIMENTS - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

ADMINISTRATIVE INFORMATION

Job/Task Name: **DRILLING (HSA or Rotary Drill)– HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD

JOB DESCRIPTION

During the remedial activities, including excavation and backfill, a maximum of 11 borings will be drilled for both overburden and bedrock monitoring wells. These wells will be utilized for future groundwater monitoring activities. This will be accomplished using hollow-stem auger (HSA) or Rotary Drill techniques.

The removal of significant spoils, and the vapor migration space provided by the hollow auger stem can allow significant emissions of vapor-phase contaminants (in the event that volatile contaminants are present). Dusts from the surface spoils (entrained by wind on the site) released by augering can produce significant concentrations of contaminated aerosols where soils have been impacted by subsurface contamination.

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 (Arsenic)
- ☐ 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/Trenches (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*): ____

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☒ Rubber or Tyvex (ANSI safety-toe)
- ☒ Leather (ANSI safety-toe)

General:
- ☒ Coveralls Tyvex
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR Combo Dust & VOC
- ☐ ½-face APR Combo Dust & VOC (equipment operators ONLY)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

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

Gloves:
- ☒ Chemically-protective Latex and/or Nitrile
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety ________(*volts*)

Other (*List*):____

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy equipment Shovels, lifting straps, cables, Chains, ladder, utility knife, pressure washer

ADMINISTRATIVE INFORMATION	
Job/Task Name: **DRILLING (HSA or Rotary Drill)– HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD
APPLICABLE SOPS (SEE HASP/SSHP/APP)	**TRAINING REQUIREMENTS**
• Hearing Conservation (SH&E 109) • Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Electrical Safety Program (SH&E 121) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Hazardous Waste Operations (SH&E 301) • Overhead Electrical Lines (SH&E 310) • Drilling (SH&E 403) • Manual Lifting (SH&E 404) • Manual Hand Tools (SH&E 506) • Fire Extinguishers (SH&E 508) • Heavy Equipment (SH&E 513) • Decontamination (SH&E 604)	• HAZWOPER 40 hour and current 8 hr refresher certification if needed. • Respirator and Hearing Conservation Training • Excavation and Trenching Awareness Training • Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **DRILLING (HSA or Rotary Drill)– HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

1. A *Heavy Equipment Inspection Form* will be completed for each piece of heavy equipment before it is put into operation on site. It is anticipated that the following heavy equipment will be utilized; backhoe, excavator with hammer attachment, and loader)
2. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Insects
3. Evaluate surrounding work area for additional hazards that may be present.
4. Identify areas of poison ivy prior to beginning cutting operations.
5. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
6. Keep fire extinguisher in work area and within heavy equipment.

MONITORING PROCEDURES

ADMINISTRATIVE INFORMATION	
Job/Task Name: **DRILLING (HSA or Rotary Drill)– HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD

PARAMETER	MONITORING INTERVAL	RESPONSE LEVEL (above background)	RESPONSE
VOCs	Every 30 minutes during excavation activities	< 10 units	Continue work in Modified Level D and continue monitoring.
		10 – 20 units (Sustained for more than 5 minutes)	Monitor for benzene. Continue work in Modified Level D unless benzene is present above 1.0 ppm, and continue monitoring.
		20 – 50 units (Sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge), and continue monitoring.
		> 50 units (Sustained for more than 5 minutes)	Cease work.
Benzene (By Colorimetric Tube)	30-minute intervals where indicted by VOC readings	< 1.0 ppm (No color change)	Continue work in Modified Level D and continue monitoring.
		> 1.0 ppm	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge).
Airborne Particulates (by miniRam)	Every 30 minutes when soil handling is occurring	<3 mg/m^3	Continue work in Modified Level D and continue monitoring.
		3 – 15 mg/m^3	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (N100 cartridge).
		> 15 mg/m^3	Cease work.

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **DRILLING (HSA or Rotary Drill)– HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

ADMINISTRATIVE INFORMATION

Job/Task Name: **INSTALLATION OF GW MONITORING WELLS (HSA or Rotary Drill)– HAZWOPER**

Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD

JOB DESCRIPTION

During the remedial activities, including excavation and backfill, a maximum of eight overburden and three bedrock monitoring wells will be installed and will be used for future groundwater monitoring activities. This will be accomplished using hollow-stem auger (HSA) or Rotary Drill techniques.

The removal of significant spoils, and the vapor migration space provided by the hollow auger stem can allow significant emissions of vapor-phase contaminants (in the event that volatile contaminants are present). Dusts from the surface spoils (entrained by wind on the site) released by augering can produce significant concentrations of contaminated aerosols where soils have been impacted by subsurface contamination.

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 (Arsenic)
- ☐ 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/Trenches (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*):

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☒ Rubber or Tyvex (ANSI safety-toe)
- ☒ Leather (ANSI safety-toe)

General:
- ☒ Coveralls Tyvex
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR Combo Dust & VOC
- ☐ ½-face APR Combo Dust & VOC (equipment operators ONLY)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

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

Gloves:
- ☒ Chemically-protective Latex and/or Nitrile
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety ________(*volts*)

Other (*List*):

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy equipment Shovels, lifting straps, cables, Chains, ladder, utility knife, pressure washer

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALLATION OF GW MONITORING WELLS (HSA or Rotary Drill)– HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD
APPLICABLE SOPS (SEE HASP/SSHP/APP)	**TRAINING REQUIREMENTS**
• Hearing Conservation (SH&E 109) • Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Electrical Safety Program (SH&E 121) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Hazardous Waste Operations (SH&E 301) • Overhead Electrical Lines (SH&E 310) • Drilling (SH&E 403) • Manual Lifting (SH&E 404) • Manual Hand Tools (SH&E 506) • Fire Extinguishers (SH&E 508) • Heavy Equipment (SH&E 513) • Decontamination (SH&E 604)	• HAZWOPER 40 hour and current 8 hr refresher certification if needed. • Respirator and Hearing Conservation Training • Excavation and Trenching Awareness Training • Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALLATION OF GW MONITORING WELLS (HSA or Rotary Drill)– HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

7. A *Heavy Equipment Inspection Form* will be completed for each piece of heavy equipment before it is put into operation on site. It is anticipated that the following heavy equipment will be utilized; backhoe, excavator with hammer attachment, and loader)
8. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Insects
9. Evaluate surrounding work area for additional hazards that may be present.
10. Identify areas of poison ivy prior to beginning cutting operations.
11. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
12. Keep fire extinguisher in work area and within heavy equipment.

MONITORING PROCEDURES

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALLATION OF GW MONITORING WELLS (HSA or Rotary Drill)– HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD

PARAMETER	MONITORING INTERVAL	RESPONSE LEVEL (above background)	RESPONSE
VOCs	Every 30 minutes during excavation activities	< 10 units	Continue work in Modified Level D and continue monitoring.
		10 – 20 units (Sustained for more than 5 minutes)	Monitor for benzene. Continue work in Modified Level D unless benzene is present above 1.0 ppm, and continue monitoring.
		20 – 50 units (Sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge), and continue monitoring.
		> 50 units (Sustained for more than 5 minutes)	Cease work.
Benzene (By Colorimetric Tube)	30-minute intervals where indicted by VOC readings	< 1.0 ppm (No color change)	Continue work in Modified Level D and continue monitoring.
		> 1.0 ppm	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge).
Airborne Particulates (by miniRam)	Every 30 minutes when soil handling is occurring	<3 mg/m^3	Continue work in Modified Level D and continue monitoring.
		$3 – 15$ mg/m^3	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (N100 cartridge).
		> 15 mg/m^3	Cease work.

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EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INSTALLATION OF GW MONITORING WELLS (HSA or Rotary Drill)– HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech and Parratt Wolf	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION

Job/Task Name: **SAMPLE COLLECTION AND HANDLING - HAZWOPER**

Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

Subsurface soil samples will be collected during the installation of overburden and bedrock monitoring wells. In addition, confirmation samples and grab water samples will be collected prior to the completion of excavation activities. This work will occur concurrently with the soil excavation and removal, as well as HSA /Rotary drilling activity; all hazards associated with that work will apply here.

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 (Arsenic)
- ☐ 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/Trenches (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*): ______

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☒ Rubber or Tyvex (ANSI safety-toe)
- ☒ Leather (ANSI safety-toe)

General:
- ☒ Coveralls Tyvex
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR Combo Dust & VOC
- ☐ ½-face APR Combo Dust & VOC (equipment operators ONLY)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

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

Gloves:
- ☒ Chemically-protective Latex and/or Nitrile
- ☒ Leather/cloth
- ☐ Welder's
- ☒ Electrical safety near wet operations

Other (*List*): ______

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*): ______

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy Equipment (Drill Rig, excavator)
	Ladders
	Shovel

ADMINISTRATIVE INFORMATION	
Job/Task Name: **SAMPLE COLLECTION AND HANDLING - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
APPLICABLE SOPS (SEE HASP/SSHP/APP)	**TRAINING REQUIREMENTS**
• Hearing Conservation (SH&E 109) • Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Hazardous Waste Operations (SH&E 301) • Manual Lifting (SH&E 404) • Handling of Drums and Large Containers (SH&E 405) • Ladders (SH&E 501) • Manual Hand Tools (SH&E 506) • Decontamination (SH&E 604)	• HAZWOPER 40 hour and current 8 hr refresher certification if needed. • Confined Space Training (Entrant and Supervisor) • Respirator and Hearing Conservation Training • Excavation and Trenching Awareness Training • Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **SAMPLE COLLECTION AND HANDLING - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

1. A *Heavy Equipment Inspection Form* will be completed for each piece of heavy equipment before it is put into operation on site. It is anticipated that the following heavy equipment will be utilized; backhoe, excavator, and loader).
2. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Insects
3. Evaluate surrounding work area for additional hazards that may be present.
4. Identify areas of poison ivy prior to beginning cutting operations.
5. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
6. Keep fire extinguisher in work area and within heavy equipment.

MONITORING PROCEDURES

ADMINISTRATIVE INFORMATION	
Job/Task Name: **SAMPLE COLLECTION AND HANDLING - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

PARAMETER	MONITORING INTERVAL	RESPONSE LEVEL (above background)	RESPONSE
VOCs	Every 30 minutes during excavation activities	< 10 units	Continue work in Modified Level D and continue monitoring.
		10 – 20 units (Sustained for more than 5 minutes)	Monitor for benzene. Continue work in Modified Level D unless benzene is present above 1.0 ppm, and continue monitoring.
		20 – 50 units (Sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge), and continue monitoring.
		> 50 units (Sustained for more than 5 minutes)	Cease work.
Benzene (By Colorimetric Tube)	30-minute intervals where indicted by VOC readings	< 1.0 ppm (No color change)	Continue work in Modified Level D and continue monitoring.
		> 1.0 ppm	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge).
Airborne Particulates (by miniRam)	Every 30 minutes when soil handling is occurring	<3 mg/m^3	Continue work in Modified Level D and continue monitoring.
		3 – 15 mg/m^3	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (N100 cartridge).
		> 50 mg/m^3	Cease work.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **SAMPLE COLLECTION AND HANDLING - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

ADMINISTRATIVE INFORMATION

Job/Task Name: **DECONTAMINATION OF EQUIPMENT - HAZWOPER**

Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

This task includes selecting, constructing, and removal of the decontamination areas, as well as performing equipment decontamination.

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 (Arsenic)
- ☐ 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/Trenches (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*):

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☒ Rubber or Tyvex (ANSI safety-toe)
- ☒ Leather (ANSI safety-toe)

General:
- ☒ Coveralls Tyvex
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR Combo Dust & VOC
- ☐ ½-face APR Combo Dust & VOC (equipment operators ONLY)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

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

Gloves:
- ☒ Chemically-protective Latex and/or Nitrile
- ☒ Leather/cloth
- ☐ Welder's
- ☒ Electrical safety near wet operations

Other (*List*):

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Generator
	Pumps
	Pressure Washers
	Hand Tools
	Power Tools

ADMINISTRATIVE INFORMATION	
Job/Task Name: **DECONTAMINATION OF EQUIPMENT - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

APPLICABLE SOPs (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
• Hearing Conservation (SH&E 109) • Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Safety Rules (SH&E 201) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Hazardous Waste Operations (SH&E 301) • Manual Lifting (SH&E 404) • Powered Hand Tools (SH&E 505) • Manual Hand Tools (SH&E 506) • Fire Extinguishers (SH&E 508) • High Pressure Washers (SH&E 510) • Decontamination (SH&E 604)	• HAZWOPER 40 hour and current 8 hr refresher certification if needed. • Respirator and Hearing Conservation Training • Excavation and Trenching Awareness Training • Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **DECONTAMINATION OF EQUIPMENT - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

1. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Insects
2. Evaluate surrounding work area for additional hazards that may be present.
3. Identify areas of poison ivy prior to beginning cutting operations.
4. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
5. Keep fire extinguisher in work area and within heavy equipment.
6. Do not fuel power equipment while engines/motors are hot.

MONITORING PROCEDURES

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **DECONTAMINATION OF EQUIPMENT - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INVESTIGATIVE-DERIVED WASTE MANAGEMENT - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

Both solid and liquid wastes are generated during field activities. Solid wastes include disposable items such as plastic sheeting, Teflon tubing, and nitrile gloves. To identify potential hazards, the solids from groundwater sampling activities will be screened in the field with a photoionization detector (PID). Liquid wastes are limited to decontamination solutions and purge water from monitoring well (MW) sampling activities. Solid waste materials will be consolidated in trash bags and at the end of each day, sealed and placed in a dumpster at the site for disposal in a Subtitle D Landfill. Additionally, waste minimization and pollution prevention processes and techniques will be implemented to the greatest extent practicable (e.g., using micro-purging to minimize the amount of purge water generated).

Monitoring well purge water will be contained in labeled 55-gallon drums stored at the site. Earth Tech will coordinate disposal with a disposal contractor.

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 (Arsenic)
- ☐ 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/Trenches (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*): ____

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☒ Rubber or Tyvex (ANSI safety-toe)
- ☒ Leather (ANSI safety-toe)

General:
- ☒ Coveralls Tyvex
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR Combo Dust & VOC
- ☐ ½-face APR Combo Dust & VOC (equipment operators ONLY)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

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

Gloves:
- ☒ Chemically-protective Latex and/or Nitrile
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety near wet operations

Other (*List*): ____

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*): ____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INVESTIGATIVE-DERIVED WASTE MANAGEMENT - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
APPLICABLE SOPS (SEE HASP/SSHP/APP)	**TRAINING REQUIREMENTS**
• Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Safety Rules (SH&E 201) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Hazardous Waste Operations (SH&E 301) • Manual Lifting (SH&E 404) • Handling Drums and Large Containers (SH&E 405) • Drum Sampling (SH&E 406) • Manual Hand Tools (SH&E 506) • Decontamination (SH&E 604)	• HAZWOPER 40 hour and current 8 hr refresher certification if needed. • Respirator and Hearing Conservation Training • Excavation and Trenching Awareness Training • Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INVESTIGATIVE-DERIVED WASTE MANAGEMENT - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

1. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Insects
2. Evaluate surrounding work area for additional hazards that may be present.
3. Identify areas of poison ivy prior to beginning cutting operations.
4. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
5. Keep fire extinguisher in work area and within heavy equipment.
6. Do not fuel power equipment while engines/motors are hot.

MONITORING PROCEDURES

- Monitor with PID at well head, if less than 50 ppm , no further monitoring required. If greater than 50 ppm let well vent for 5 minutes and re-check.

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **INVESTIGATIVE-DERIVED WASTE MANAGEMENT - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

ADMINISTRATIVE INFORMATION

Job/Task Name: **GROUNDWATER MONITORING - HAZWOPER**

Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

Water levels will be measured prior to groundwater sampling. Prior to sampling, Earth Tech will purge the wells to remove standing water. Water samples will be collected via bailing or pumping. Field measurements will consist of pH, temperature, dissolved oxygen, turbidity, and specific conductance analysis. Groundwater samples will be collected in sample containers prepared by the laboratory.

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 (Arsenic)

☐ 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/Trenches (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*):
Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
☒ Rubber or Tyvex (ANSI safety-toe)
☒ Leather (ANSI safety-toe)

General:
☒ Coveralls Tyvex
☒ Full Length Pants
☒ Reflective Safety Vest
☒ Hearing protection (plugs/muffs)
☐ FF APR Combo Dust & VOC
☐ ½-face APR Combo Dust & VOC (equipment operators ONLY)
☐ Safety harness & lanyard
☒ ANSI-approved Hard hat

Eye Protection:
☐ Faceshield
☒ Safety glasses or goggles (ANSI)
☐ Welder's helmet/goggles

Gloves:
☒ Chemically-protective Latex and/or Nitrile
☒ Leather/cloth
☐ Welder's
☐ Electrical safety near wet operations

Other (*List*):

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

☒ Fire ext. 1A:10B:C (*rating*)
☒ First-aid kit
☒ Insect repellent
☒ Dust and VOC control/mitigation

☒ Portable eyewash
☐ Fire watch
☒ Traffic control measures

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Pump
	Tubing
	Water Quality Meter

ADMINISTRATIVE INFORMATION	
Job/Task Name: **GROUNDWATER MONITORING - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

APPLICABLE SOPS (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
• Hearing Conservation (SH&E 109) • Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Hazardous Waste Operations (SH&E 301) • Manual Lifting (SH&E 404) • Powered Hand Tools (SH&E 505) • Manual Hand Tools (SH&E 506) • Decontamination (SH&E 604)	• HAZWOPER 40 hour and current 8 hr refresher certification if needed. • Respirator and Hearing Conservation Training • Excavation and Trenching Awareness Training • Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **GROUNDWATER MONITORING - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

7. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Insects
8. Evaluate surrounding work area for additional hazards that may be present.
9. Identify areas of poison ivy prior to beginning cutting operations.
10. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
11. Keep fire extinguisher in work area and within heavy equipment.
12. Do not fuel power equipment while engines/motors are hot.

MONITORING PROCEDURES

- Monitor with PID at well head, if less than 50 ppm , no further monitoring required. If greater than 50 ppm let well vent for 5 minutes and re-check.

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **GROUNDWATER MONITORING - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

EarthTech
A Tyco International Ltd. Company

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION

Job/Task Name: **EOS® INJECTION - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

The focused feasibility study at the Base will involve injection of EOS® into the horizontal monitoring wells placed in the base of the excavation at Site 6. The injected amendments will biostimulate the existing microbial community to degrade site contaminants.

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 (Arsenic)
- ☐ 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/Trenches (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*): ____

Biological hazards (i.e. insect bits), poisonous plant contact

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☒ Rubber or Tyvex (ANSI safety-toe)
- ☒ Leather (ANSI safety-toe)

General:
- ☒ Coveralls Tyvex
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR Combo Dust & VOC
- ☐ ½-face APR Combo Dust & VOC (equipment operators ONLY)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

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

Gloves:
- ☒ Chemically-protective Latex and/or Nitrile
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety near wet operations

Other (*List*): ____

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*): ____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Pump Tubing

ADMINISTRATIVE INFORMATION	
Job/Task Name: **EOS® INJECTION - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

APPLICABLE SOPS (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
• Hearing Conservation (SH&E 109) • Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Safety Rules (SH&E 201) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Hazardous Waste Operations (SH&E 301) • Manual Lifting (SH&E 404) • Powered Hand Tools (SH&E 505) • Manual Hand Tools (SH&E 506) • Decontamination (SH&E 604)	• HAZWOPER 40 hour and current 8 hr refresher certification if needed. • Respirator and Hearing Conservation Training • Excavation and Trenching Awareness Training • Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **EOS® INJECTION - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

13. Earth Tech (Northeast) Safety Alert July 2006 Ticks and Biting Insects
14. Evaluate surrounding work area for additional hazards that may be present.
15. Identify areas of poison ivy prior to beginning cutting operations.
16. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
17. Keep fire extinguisher in work area and within heavy equipment.
18. Do not fuel power equipment while engines/motors are hot.

MONITORING PROCEDURES

- Monitor with PID at well head, if less than 50 ppm , no further monitoring required. If greater than 50 ppm let well vent for 5 minutes and re-check.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **EOS® INJECTION - HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Remediation Activities	Type of Job/Task: ☒ One time ☐ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION

Job/Task Name: **BACKFILING AND COMPACTION – NON-HAZWOPER**

Project Name: Schenectady ANGB.	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Restoration Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

The backfilled areas will be compacted in 8-inch lifts. Soil will be compacted using a vibratory roller and compaction testing will be performed per Contract Documents. Backfill will be supplied from Cedar Hill and drivers will provide delivery to the site. Backfilling operations will follow the excavation schedule. Backfill of an area will be completed after a post excavation survey of an area has been performed. Backfill operations are expected to occur promptly upon the completion of excavation to minimize open excavations and prevent both run on and run off.

All Backfill trucks exiting the site will be closely monitored to insure that soil, although clean backfill, is not being tracked onto the local roadways. Earth Tech is sensitive to the public perception of soil being tracked onto public roadways and will take the necessary precautions to keep the local roadways clean and free of soil being tracked off-site.

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

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

PHYSICAL HAZARDS

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

Other Chemical/Physical Hazards (*List*):

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☐ Rubber or Tyvex (ANSI safety-toe)
- ☒ Leather (ANSI safety-toe)

General:
- ☐ Coveralls Tyvex
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR Combo Dust & VOC
- ☐ ½-face APR Combo Dust & VOC (equipment operators ONLY)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

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

Gloves:
- ☐ Chemically-protective Latex and/or Nitrile
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety ________(*volts*)

Other (*List*):

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy equipment
	Trucks

ADMINISTRATIVE INFORMATION	
Job/Task Name: **BACKFILING AND COMPACTION – NON-HAZWOPER**	
Project Name: Schenectady ANGB.	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Restoration Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

APPLICABLE SOPS (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
• Hearing Conservation (SH&E 109) • Personal Protective Equipment (SH&E 113) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Overhead Electrical Lines (SHE 310) • Manual Lifting (SH&E 404) • Ladders (SH&E 501) • Fire Extinguishers (SH&E 508) • Heavy Equipment (SH&E 513)	• Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **BACKFILING AND COMPACTION – NON-HAZWOPER**	
Project Name: Schenectady ANGB.	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Restoration Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ADDITIONAL SAFETY CONSIDERATIONS

1. A *Heavy Equipment Inspection Form* will be completed for each piece of heavy equipment before it is put into operation on site. It is anticipated that the following equipment will be utilized; backhoe, excavator, skid steer, and roller)
2. Earth Tech (Northeast) Injury Alert June 2006 Chop Saw Injury
3. Evaluate surrounding work area for additional hazards that may be present.
4. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
5. Keep fire extinguisher in work area and within heavy equipment.
6. Do not fuel power equipment while engines/motors are hot.

MONITORING PROCEDURES

No occupational Exposure Monitoring required. Non-HAZWOPER work.

ADMINISTRATIVE INFORMATION	
Job/Task Name: **BACKFILING AND COMPACTION – NON-HAZWOPER**	
Project Name: Schenectady ANGB.	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Restoration Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **RESTORATION – NON-HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Restoration Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

JOB DESCRIPTION

As areas are raised to finished grade, an approved subbase will then be installed. The erosion control measures will be maintained until growth of the vegetation has been established or site has been restored to original surface cover. All excavation shoring systems will be removed and decontaminated prior to leaving the site. Equipment decontamination pads will be removed after all equipment and materials requiring decon are complete.

Temporary fencing and barricades, and signage will be removed from site.

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

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

PHYSICAL HAZARDS

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

Other Chemical/Physical Hazards (*List*):

Biological hazards (i.e. insect bits), poisonous plant contact)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
- ☐ Rubber or Tyvex (ANSI safety-toe)
- ☒ Leather (ANSI safety-toe)

General:
- ☐ Coveralls Tyvex
- ☒ Full Length Pants
- ☒ Reflective Safety Vest
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR Combo Dust & VOC
- ☐ ½-face APR Combo Dust & VOC (equipment operators ONLY)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

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

Gloves:
- ☐ Chemically-protective Latex and/or Nitrile
- ☒ Leather/cloth
- ☒ Welder's
- ☐ Electrical safety ________(*volts*)

Other (*List*):

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

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

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
None	Heavy equipment
	shovels
	lifting straps, cables, chains
	chop saw
	ladder

ADMINISTRATIVE INFORMATION	
Job/Task Name: **RESTORATION – NON-HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Restoration Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD

APPLICABLE SOPS (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
• Hearing Conservation (SH&E 109) • Respiratory Protection (SH&E 112) • Personal Protective Equipment (SH&E 113) • Ergonomics Program (SH&E 123) • Heat Stress Prevention Program (SH&E 124) • Cold Stress Prevention Program (SH&E 125) • General Housekeeping, Hygiene, and Sanitation (SH&E 208) • Walking-Working Surfaces Protection (SH&E 210) • Manual Lifting (SH&E 404) • Ladders (SH&E 501) • Powered Hand Tools (SH&E 505) • Manual Hand Tools (SH&E 506) • Fire Extinguishers (SH&E 508) • High Pressure Washers (SH&E 510) • Heavy Equipment (SH&E 513) • Decontamination (SH&E 604)	• Review site specific Health and Safety Plan, THA, and sign off. • Approved and experience heavy equipment operators will be allowed to operate heavy equipment. • Review Earth Tech Safety Cards where applicable.

EARTH TECH, INC.
SCHENECTADY ANGB, SCOTIA, NY
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: **RESTORATION – NON-HAZWOPER**	
Project Name: Schenectady ANGB	Project Location: Scotia, NY
Project Manager: Scott Underhill	Analysis Performed By: Lucas Benedict
Date Job/Task to be performed: Restoration Activities	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: Earth Tech	Job Supervisor: TBD
ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

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ATTACHMENT D
Chemical Safety Cards

International Chemical Safety Cards

VINYLIDENE CHLORIDE

ICSC: 0083

1,1-Dichloroethene
1,1-Dichloroethylene
VDC
$C_2H_2Cl_2$ / $H_2C=CCl_2$
Molecular mass: 97

ICSC # 0083
CAS # 75-35-4
RTECS # KV9275000
UN # 1303 (stabilized)
EC # 602-025-00-8
April 13, 2000 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Dizziness. Drowsiness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
•SKIN	Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	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	Abdominal pain. Sore throat. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! 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 wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Fireproof. Provision to contain effluent from fire extinguishing. Separated from incompatible materials (see Chemical Dangers). Cool. Keep in the dark. Store only if stabilized.	Airtight. Unbreakable packaging; put breakable packaging into closed unbreakable container. Marine pollutant. Note: D F+ symbol Xn symbol R: 12-20-40 S: 2-7-16-29-36/37-46 UN Hazard Class: 3 UN Packing Group: I

International Chemical Safety Cards

TRICHLOROETHYLENE

ICSC: 0081

TRICHLOROETHYLENE
1,1,2-Trichloroethylene
Trichloroethene
Ethylene trichloride
C_2HCl_3/$ClCH=CCl_2$
Molecular mass: 131.4

CAS # 79-01-6
RTECS # KX4550000
ICSC # 0081
UN # 1710
EC # 602-027-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions. See Notes.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Risk of fire and explosion (see Chemical Dangers).		In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
• **INHALATION**	Dizziness. Drowsiness. Headache. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. 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**	Abdominal pain (further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. 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 (extra personal protection: self-contained breathing apparatus).	Separated from metals (see Chemical Dangers), strong bases, food and feedstuffs. Dry. Keep in the dark. Ventilation along the floor.	Do not transport with food and feedstuffs. IMO: Marine Pollutant Xn symbol R: 40 S: 23-36/37 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

TRICHLOROETHYLENE

ICSC: 0081

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (phosgene, hydrogen chloride, chlorine). The substance decomposes on contact with strong alkali producing dichloroacetylene , which increases fire hazard. Reacts violently with metals such as lithium, magnesium aluminium, titanium, barium and sodium. Slowly decomposed by light in presence of moisture, with formulation of corrosive hydrochloric acid. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: 50 ppm; 269 mg/m^3 (STEL): 200 ppm; 1070 mg/m^3 (ACGIH 1992-1993).	**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 can be reached rather quickly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes and the skin. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure could cause lowering of consciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidney (see notes).
PHYSICAL PROPERTIES	Boiling point: 87°C Melting point: -73°C Relative density (water = 1): 1.5 Solubility in water, g/100 ml at 20°C: 0.1 Vapour pressure, kPa at 20°C: 7.8	Relative vapour density (air = 1): 4.5 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3 Auto-ignition temperature: 410°C Explosive limits, vol% in air: 8-10.5 Octanol/water partition coefficient as log Pow: 2.42
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to water organisms.	

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions. Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. Technical grades may contain small amounts of carcinogenic stabilizers.

Transport Emergency Card: TEC (R)-723
NFPA Code: H2; F1; R0;

ADDITIONAL INFORMATION

ICSC: 0081 **TRICHLOROETHYLENE**

International Chemical Safety Cards

TOLUENE

ICSC: 0078

Methylbenzene
Toluol
Phenylmethane
$C_6H_5CH_3$ / C_7H_8
Molecular mass: 92.1

ICSC # 0078
CAS # 108-88-3
RTECS # XS5250000
UN # 1294
EC # 601-021-00-3
October 10, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	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. Refer for medical attention.
•EYES	Redness. Pain.	Safety goggles.	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.	Do not eat, drink, or smoke during	Rinse mouth. Do NOT induce

	(Further see Inhalation).	work.	vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area in large spill! Consult an expert in large spill! Remove all ignition sources. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: self-contained breathing apparatus in large spill.	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-38-48/20-63-65-67 S: 2-36/37-46-62 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0078	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

TOLUENE

ICSC: 0078

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** The vapour mixes well with air, explosive mixtures are formed easily. As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts violently with strong oxidants causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 50 ppm as TWA; (skin); A4; BEI issued; (ACGIH 2004). MAK: 50 ppm, 190 mg/m³; H; Peak limitation category: II(4); Pregnancy risk group: C; (DFG 2004). OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak) NIOSH REL: TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3) NIOSH IDLH: 500 ppm See: 108883	**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 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 and the respiratory tract . The substance may cause effects on the central nervous system . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels may result in cardiac dysrhythmiaandunconsciousness. **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: 111°C Melting point: -95°C Relative density (water = 1): 0.87 Solubility in water: none Vapour pressure, kPa at 25°C: 3.8	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01 Flash point: 4°C c.c. Auto-ignition temperature: 480°C Explosive limits, vol% in air: 1.1-7.1

	Relative vapour density (air = 1): 3.1	Octanol/water partition coefficient as log Pow: 2.69
ENVIRONMENTAL DATA	 The substance is toxic to aquatic organisms.	

N O T E S
Depending on the degree of exposure, periodic medical examination is suggested. Use of alcoholic beverages enhances the harmful effect. Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response. Transport Emergency Card: TEC (R)-30S1294 NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION	

ICSC: 0078 **TOLUENE**

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

para-Xylene
1,4-Dimethylbenzene
p-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0086
CAS # 106-42-3
RTECS # ZE2625000
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! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•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.	Fireproof. Separated from strong oxidants,	

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 for organic gases and vapours.)	and strong acids .	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0086

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

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: 138°C
Melting point: 13°C
Relative density (water = 1): 0.86
Solubility in water:
none
Vapour pressure, kPa at 20°C: 0.9
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: 528°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.15

ENVIRONMENTAL DATA


The substance is toxic to aquatic organisms.

N O T E S

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 0085 m-Xylene.

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

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

ADDITIONAL INFORMATION

ICSC: 0086 **p-XYLENE**

IMPORTANT Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is

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International Chemical Safety Cards

TETRACHLOROETHYLENE

ICSC: 0076

1,1,2,2-Tetrachloroethylene
Perchloroethylene
Tetrachloroethene
C_2Cl_4 / $Cl_2C{=}CCl_2$
Molecular mass: 165.8

ICSC # 0076
CAS # 127-18-4
RTECS # KX3850000
UN # 1897
EC # 602-028-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		STRICT HYGIENE! PREVENT GENERATION OF MISTS!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. 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:	Separated from metals see Chemical Dangers food and feedstuffs Keep in the dark. Ventilation along the floor.	Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 40-51/53 S: (2-)23-36/37-61

filter respirator for organic gases and vapours).		UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0076

International Chemical Safety Cards

TETRACHLOROETHYLENE

ICSC: 0076

IMPORTANT DATA

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

PHYSICAL DANGERS:
The vapour is heavier than air.

CHEMICAL DANGERS:
On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (hydrogen chloride, phosgene, chlorine). The substance decomposes slowly on contact with moisture producing trichloroacetic acid and hydrochloric acid. Reacts with metals such as aluminium, lithium, barium, beryllium.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 25 ppm; (STEL): 100 ppm; (ACGIH 1999).
OSHA PEL: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3-hours)
NIOSH REL: Ca Minimize workplace exposure concentrations. See Appendix A
NIOSH IDLH: Potential occupational carcinogen 150 ppm

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation 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 irritates the eyes, the skin and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels may result in unconsciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 121°C
Melting point: -22°C
Relative density (water = 1): 1.6
Solubility in water, g/100 ml at 20°C: 0.015
Vapour pressure, kPa at 20°C: 1.9
Relative vapour density (air = 1): 5.8
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09
Octanol/water partition coefficient as log Pow: 2.9

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

Transport Emergency Card: TEC (R)-722
NFPA Code: H2; F0; R0;

ADDITIONAL INFORMATION

ICSC: 0076	TETRACHLOROETHYLENE

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

ortho-Xylene
1,2-Dimethylbenzene
o-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0084
CAS # 95-47-6
RTECS # ZE2450000
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 32°C explosive vapour/air mixtures may be formed.	Above 32°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! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•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.	Fireproof. Separated from strong oxidants	

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 for organic gases and vapours.)	and strong acids .	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0084

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

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: 144°C
Melting point: -25°C
Relative density (water = 1): 0.88
Solubility in water:
none
Vapour pressure, kPa at 20°C: 0.7
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 32°C c.c.
Auto-ignition temperature: 463°C
Explosive limits, vol% in air: 0.9-6.7
Octanol/water partition coefficient as log Pow: 3.12

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0086 p-Xylene and 0085 m-Xylene.

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

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

ADDITIONAL INFORMATION

ICSC: 0084 **o-XYLENE**

IMPORTANT	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is

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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.	Fireproof. Separated from strong oxidants and strong acids .	Note: C Xn symbol

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 for organic gases and vapours.)		R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0085	

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.	

N O T E S

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	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is

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International Chemical Safety Cards

INDENO(1,2,3-cd)PYRENE

ICSC: 0730

o-Phenylenepyrene
2,3-Phenylenepyrene
$C_{22}H_{12}$
Molecular mass: 276.3

ICSC # 0730
CAS # 193-39-5
RTECS # NK9300000
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles 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		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	R: S:

SEE IMPORTANT INFORMATION ON BACK

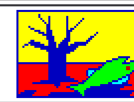
ICSC: 0730

International Chemical Safety Cards

INDENO(1,2,3-cd)PYRENE

ICSC: 0730

I M	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

IMPORTANT DATA		
I M P O R T A N T D A T A	**PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004).	**INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 536°C Melting point: 164°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.58
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish.	

N O T E S

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0730 **INDENO(1,2,3-cd)PYRENE**

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

Ethylbenzol
Phenylethane
EB
C_8H_{10} / $C_6H_5C_2H_5$
Molecular mass: 106.2

ICSC # 0268
CAS # 100-41-4
RTECS # DA0700000
UN # 1175
EC # 601-023-00-4
March 13, 1995 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Cough. Dizziness. Drowsiness. Headache.	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. Blurred vision.	Face shield 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	(Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Collect leaking liquid in covered containers. Absorb remaining	Fireproof. Separated from strong oxidants.	F symbol

liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: A filter respirator for organic gases and vapours.		Xn symbol R: 11-20 S: 2-16-24/25-29 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0268	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

ETHYLBENZENE

ICSC: 0268

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH AROMATIC ODOUR. **PHYSICAL DANGERS:** The vapour mixes well with air, explosive mixtures are easily formed. **CHEMICAL DANGERS:** Reacts with strong oxidants. Attacks plastic and rubber. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA, 125 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2004). MAK: skin absorption (H); Carcinogen category: 3A; (DFG 2004). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 125 ppm (545 mg/m^3) NIOSH IDLH: 800 ppm 10%LEL See: 100414	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour, 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 , the skin and the respiratory tract . Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system . Exposure far above the OEL could cause lowering of consciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis.
PHYSICAL PROPERTIES	Boiling point: 136°C Melting point: -95°C Relative density (water = 1): 0.9 Solubility in water, g/100 ml at 20°C: 0.015 Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 18°C c.c. Auto-ignition temperature: 432°C Explosive limits, vol% in air: 1.0-6.7 Octanol/water partition coefficient as log Pow: 3.2
ENVIRONMENTAL DATA	The substance is harmful to aquatic organisms.	

N O T E S

The odour warning when the exposure limit value is exceeded is insufficient. Card has been partly updated in October 2005. See sections Occupational Exposure Limits, Emergency Response.

Transport Emergency Card: TEC (R)-30S1175 or 30GF1-I+II

NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION	

ICSC: 0268	**ETHYLBENZENE**

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International Chemical Safety Cards

BENZO(k)FLUORANTHENE

ICSC: 0721

Dibenzo(b,jk)fluorene
8,9-Benzofluoranthene
11,12-Benzofluoranthene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0721
CAS # 207-08-9
RTECS # DF6350000
EC # 601-036-00-5
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0721

International Chemical Safety Cards

BENZO(k)FLUORANTHENE

ICSC: 0721

I

MPORTANT DATA

PHYSICAL STATE; APPEARANCE:
YELLOW CRYSTALS

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Upon heating, toxic fumes are formed.

OCCUPATIONAL EXPOSURE LIMITS:
TLV not established.
MAK:
Carcinogen category: 2;
(DFG 2004).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 480°C
Melting point: 217°C
Solubility in water:
none

Octanol/water partition coefficient as log Pow: 6.84

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and in fish.

NOTES

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0721 **BENZO(k)FLUORANTHENE**

IMPORTANT LEGAL NOTICE:

International Chemical Safety Cards

BENZO(ghi)PERYLENE

ICSC: 0739

1,12-Benzoperylene
1,12-Benzperylene
$C_{22}H_{12}$
Molecular mass: 276.3

ICSC # 0739
CAS # 191-24-2
RTECS # DI6200500
October 18, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions.	NO open flames.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Well closed.	R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0739

International Chemical Safety Cards

BENZO(ghi)PERYLENE

ICSC: 0739

I M	**PHYSICAL STATE; APPEARANCE:** PALE YELLOW-GREEN CRYSTALS. **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

I M P O R T A N T D A T A

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Upon heating, toxic fumes are formed.

OCCUPATIONAL EXPOSURE LIMITS:
TLV not established.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:

PHYSICAL PROPERTIES

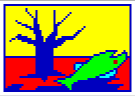
Boiling point: 550°C
Melting point: 278°C
Density: 1.3
g/cm3

Solubility in water:

none
Octanol/water partition coefficient as log Pow: 6.58

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to air and water.



N O T E S

Benzo(ghi)perylene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0739 **BENZO(ghi)PERYLENE**

International Chemical Safety Cards

BENZO(b)FLUORANTHENE

ICSC: 0720

Benz(e)acephenanthrylene
2,3-Benzofluoroanthene
Benzo(e)fluoranthene
3,4-Benzofluoranthene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0720
CAS # 205-99-2
RTECS # CU1400000
EC # 601-034-00-4
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles 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		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0720

International Chemical Safety Cards

BENZO(b)FLUORANTHENE

ICSC: 0720

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS CRYSTALS

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Upon heating, toxic fumes are formed.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: A2 (suspected human carcinogen); (ACGIH 2004).
MAK:
Carcinogen category: 2;
(DFG 2004).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is possibly carcinogenic to humans. May cause genetic damage in humans.

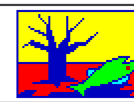
PHYSICAL PROPERTIES

Boiling point: 481°C
Melting point: 168°C
Solubility in water:
none

Octanol/water partition coefficient as log Pow: 6.12

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to air quality and water quality.



N O T E S

Benzo(b)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(b)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0720 **BENZO(b)FLUORANTHENE**

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.

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene
$C_{18}H_{12}$
Molecular mass: 228.3

ICSC # 0385
CAS # 56-55-3
RTECS # CV9275000
EC # 601-033-00-9
October 23, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles , face shield 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		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: complete protective clothing including self-contained breathing apparatus.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0385

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

BENZ(a)ANTHRACENE

ICSC: 0385

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS TO YELLOW - BROWN FLUORESCENT FLAKES OR POWDER.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS:
TLV: A2 (suspected human carcinogen); (ACGIH 2004).
MAK:
Carcinogen category: 2 (as pyrolysis product of organic materials)
(DFG 2005).

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

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is probably carcinogenic to humans.

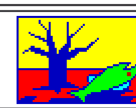
PHYSICAL PROPERTIES

Sublimation point: 435°C
Melting point: 162°C
Relative density (water = 1): 1.274
Solubility in water:
none

Vapour pressure, Pa at 20°C: 292
Octanol/water partition coefficient as log Pow: 5.61

ENVIRONMENTAL DATA

Bioaccumulation of this chemical may occur in seafood.



NOTES

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name. Card has been partly updated in October 2005 and August 2006: see sections Occupational Exposure Limits, EU classification.

ADDITIONAL INFORMATION

ICSC: 0385 **BENZ(a)ANTHRACENE**

International Chemical Safety Cards

PYRENE

ICSC: 1474

Benzo (d,e,f) phenanthrene
beta-Pyrene
$C_{16}H_{10}$
Molecular mass: 202.26

ICSC # 1474
CAS # 129-00-0
RTECS # UR2450000
November 27, 2003 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking.	Water spray, carbon dioxide, dry powder, alcohol-resistant foam, or polymer foam.
EXPLOSION			
EXPOSURE			
•INHALATION		Avoid inhalation of dust .	Fresh air, rest.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder . Do NOT let this chemical enter the environment. (Extra personal protection: P2 filter respirator for harmful particles.)	Separated from strong oxidants. Keep in a well-ventilated room.	Do not transport with food and feedstuffs. R: S:

SEE IMPORTANT INFORMATION ON BACK

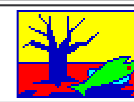
ICSC: 1474

International Chemical Safety Cards

PYRENE

ICSC: 1474

I	PHYSICAL STATE; APPEARANCE:	ROUTES OF EXPOSURE:

M P O R T A N T D A T A	PALE YELLOW OR COLOURLESS SOLID IN VARIOUS FORMS **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on heating producing irritating fumes . **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK not established.	The substance can be absorbed into the body by inhalation , through the skin and by ingestion . **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Exposure to sun may provoke an irritating effect of pyrene on skin and lead to chronic skin discoloration. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 404°C Melting point: 151°C Density: 1.27 g/cm3	Solubility in water: 0.135 mg/l at 25°C Vapour pressure, Pa at °C: 0.08 Octanol/water partition coefficient as log Pow: 4.88
ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in crustacea,in fish,in milk,in algae andin molluscs. It is strongly advised that this substance does not enter the environment. 	

NOTES

Pyrene is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, pyrene may be encountered as a laboratory chemical in its pure form. Health effects of exposure to the substance have not been investigated adequately. See ICSC 1415 Coal-tar pitch.

ADDITIONAL INFORMATION

ICSC: 1474 **PYRENE**

International Chemical Safety Cards

BENZO(a)PYRENE

ICSC: 0104

National Institute for Occupational Safety and Health

Benz(a)pyrene
3,4-Benzopyrene
Benzo(d,e,f)chrysene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0104
CAS # 50-32-8
RTECS # DJ3675000
EC # 601-032-00-3
October 17, 2005 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, foam, powder, carbon dioxide.
EXPLOSION			
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		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		Do not eat, drink, or smoke during work.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants.	T symbol N symbol R: 45-46-60-61-43-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0104

International Chemical Safety Cards

BENZO(a)PYRENE

ICSC: 0104

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
PALE-YELLOW CRYSTALS

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Reacts with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: Exposure by all routes should be carefully controlled to levels as low as possible A2 (suspected human carcinogen); (ACGIH 2005).
MAK:
Carcinogen category: 2; Germ cell mutagen group: 2; (DFG 2005).

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

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 496°C
Melting point: 178.1°C
Density: 1.4 g/cm³
Solubility in water: none (<0.1 g/100 ml)
Vapour pressure : negligible
Octanol/water partition coefficient as log Pow: 6.04

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, in plants and in molluscs. The substance may cause long-term effects in the aquatic environment.

NOTES

Do NOT take working clothes home. Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ADDITIONAL INFORMATION

ICSC: 0104 BENZO(a)PYRENE

International Chemical Safety Cards

BENZENE

ICSC: 0015

Cyclohexatriene
Benzol
C_6H_6
Molecular mass: 78.1

ICSC # 0015
CAS # 71-43-2
RTECS # CY1400000
UN # 1114
EC # 601-020-00-8
May 06, 2003 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive. Risk of fire and explosion: see Chemical Dangers.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness. Pain. (Further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
•EYES	Redness. Pain.	Face shield, 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	Abdominal pain. Sore throat. Vomiting. (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
Remove all ignition sources. Collect leaking and spilled liquid in sealable	Fireproof. Separated from food and feedstuffs oxidants and halogens .	Do not transport with food and feedstuffs. Note: E

containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.		F symbol T symbol R: 45-46-11-36/38-48/23/24/25-65 S: 53-45 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0015	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

BENZENE

ICSC: 0015

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts violently with oxidants, nitric acid, sulfuric acid and halogens causing fire and explosion hazard. Attacks plastic and rubber. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.5 ppm as TWA; 2.5 ppm as STEL; (skin); A1; BEI issued; (ACGIH 2004). MAK: H; Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004). OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm See Appendix F NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A NIOSH IDLH: Ca 500 ppm See: 71432	**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 can be reached very 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 . Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system , resulting in lowering of consciousness . Exposure far above the occupational exposure limit value may result in unconsciousness and death . **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the bone marrow and immune system , resulting in a decrease of blood cells. This substance is carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 80°C Melting point: 6°C Relative density (water = 1): 0.88 Solubility in water, g/100 ml at 25°C: 0.18 Vapour pressure, kPa at 20°C: 10 Relative vapour density (air = 1): 2.7	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: -11°C c.c. Auto-ignition temperature: 498°C Explosive limits, vol% in air: 1.2-8.0 Octanol/water partition coefficient as log Pow: 2.13

ENVIRONMENTAL DATA		The substance is very toxic to aquatic organisms.

N O T E S

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient. Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

Transport Emergency Card: TEC (R)-30S1114 / 30GF1-II

NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0015 **BENZENE**

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.

International Chemical Safety Cards

1,2-DICHLOROETHYLENE

ICSC: 0436

1,2-Dichloroethene
Acetylene dichloride
symmetrical Dichloroethylene
$C_2H_2Cl_2$ / ClCH=CHCl
Molecular mass: 96.95

ICSC # 0436
CAS # 540-59-0
RTECS # KV9360000
UN # 1150
EC # 602-026-00-3
May 07, 2003 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE!	
•INHALATION	Cough. Sore throat. Dizziness. Nausea. Drowsiness. Weakness. Unconsciousness. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•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	Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Remove all ignition sources. Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in dry sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. (Extra personal protection: complete protective clothing including self-contained breathing apparatus.)	Fireproof. Well closed. See Chemical Dangers.	Note: C F symbol Xn symbol R: 11-20-52/53 S: 2-7-16-29-61 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0436

International Chemical Safety Cards

1,2-DICHLOROETHYLENE

ICSC: 0436

IMPORTANT DATA

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

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible.

CHEMICAL DANGERS:
The substance decomposes on heating or under the influence of air , light and moisture producing toxic and corrosive fumes including hydrogen chloride . Reacts with strong oxidants. Reacts with copper or copper alloys, and bases to produce toxic chloroacetylene which is spontaneously flammable in contact with air. Attacks plastic.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 200 ppm as TWA; (ACGIH 2003).
MAK: 200 ppm, 800 mg/m^3;
Peak limitation category: II(2);
(DFG 2002).
OSHA PEL: TWA 200 ppm (790 mg/m^3)
NIOSH REL: TWA 200 ppm (790 mg/m^3)
NIOSH IDLH: 1000 ppm See: 540590

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 will be reached quickly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the respiratory tract . The substance may cause effects on the central nervous system at high levels , resulting in lowering of consciousness .

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

PHYSICAL PROPERTIES

Boiling point: 55°C
Relative density (water = 1): 1.28
Solubility in water: poor
Relative vapour density (air = 1): 3.34
Flash point: 2°C c.c.
Auto-ignition temperature: 460°C
Explosive limits, vol% in air: 9.7-12.8
Octanol/water partition coefficient as log Pow: 2

ENVIRONMENTAL DATA

NOTES

This compound has two isomers, cis and trans.Data for the isomers: cis-isomer (CAS 156-59-2), trans isomer (CAS 156-60-5), other boiling point 60.3, melting point -81.5°C (cis), -49.4°C (trans); flash point c.c. 6°C (cis), 2-4°C (trans); relative density (water = 1) 1.28 (cis), 1.26 (trans); vapour pressure 24.0 kPa (cis), 35.3 kPa (trans) at 20°C; relative density of the vapour/air-mixture at 20°C (air = 1): 1.6 (cis), 1.8 (trans); octanol/water partition coefficient as log Pow: 1.86 (cis), 2.09 (trans). Depending on the degree of exposure, periodic medical examination is suggested.

Transport Emergency Card: TEC (R)-30GF1-I+II

NFPA Code: H2; F3; R2;

ADDITIONAL INFORMATION

ICSC: 0436 1,2-DICHLOROETHYLENE

NIOSH Pocket Guide to Chemical Hazards

Vinyl chloride	**CAS** 75-01-4
CH_2=CHCl	**RTECS** KU9625000
Synonyms & Trade Names Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, Vinyl chloride monomer (VCM)	**DOT ID & Guide** 1086 116P

Exposure Limits	NIOSH REL: Ca See Appendix A
	OSHA PEL: [1910.1017] TWA 1 ppm C 5 ppm [15-minute]
IDLH Ca [N.D.] See: IDLH INDEX	**Conversion** 1 ppm = 2.56 mg/m^3

Physical Description
Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. [Note: Shipped as a liquefied compressed gas.]

MW: 62.5	BP: 7°F	FRZ: -256°F	Sol(77°F): 0.1%
VP: 3.3 atm	IP: 9.99 eV	RGasD: 2.21	
Fl.P: NA (Gas)	UEL: 33.0%	LEL: 3.6%	

Flammable Gas

Incompatibilities & Reactivities
Copper, oxidizers, aluminum, peroxides, iron, steel [Note: Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron & steel in presence of moisture.]

Measurement Methods
NIOSH 1007; OSHA 4, 75
See: NMAM or OSHA Methods

Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite	**First Aid** (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support

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-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin, and/or eye contact (liquid)

Symptoms Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]

Target Organs Liver, central nervous system, blood, respiratory system, lymphatic system

Cancer Site [liver cancer]

See also: INTRODUCTION See ICSC CARD: 0082 See MEDICAL TESTS: 0241

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

VINYLIDENE CHLORIDE

ICSC: 0083

IMPORTANT DATA

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

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible. Vinylidine chloride monomer vapours are uninhibited and may form polymers in vents or flame arresters of storage tanks, resulting in blockage of vents.

CHEMICAL DANGERS:
The substance can readily form explosive peroxides. The substance willl polymerize readily due to heating or under the influence of oxygen, sunlight, copper or aluminium, with fire or explosion hazard. May explode on heating or on contact with flames. The substance decomposes on burning producing toxic and corrosive fumes (hydrogen chloride , phosgene). Reacts violently with oxidants.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 5 ppm as TWA; A4 (not classifiable as a human carcinogen); (ACGIH 2004).
MAK: 2 ppm, 8.0 mg/m³;
Peak limitation category: II(2); Carcinogen category: 3B; Pregnancy risk group: C;
(DFG 2004).
OSHA PEL†: none
NIOSH REL: Ca See Appendix A
NIOSH IDLH: Ca N.D. See: IDLH INDEX

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

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

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes, the skin and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. Exposure at high levels could cause lowering of consciousness.

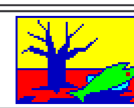
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the kidneys and liver .

PHYSICAL PROPERTIES

Boiling point: 32°C
Melting point: -122°C
Relative density (water = 1): 1.2
Solubility in water, g/100 ml at 25°C: 0.25
Vapour pressure, kPa at 20°C: 66.5
Relative vapour density (air = 1): 3.3
Relative density of the vapour/air-mixture at 20°C (air = 1): 2.5
Flash point:
-25°C c.c.
Auto-ignition temperature: 570°C
Explosive limits, vol% in air: 5.6-16
Octanol/water partition coefficient as log Pow: 1.32

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms.



NOTES

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. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. Card has been partly updated October 2004 and in April 2005. See section Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-30S1303
NFPA Code: H2; F4; R2;

ADDITIONAL INFORMATION

ICSC: 0083	VINYLIDENE CHLORIDE

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.

APPENDIX B
Field Sampling Plan

FINAL
FIELD SAMPLING PLAN

New York Air National Guard
Schenectady Air National Guard Base
1 Air National Guard Road
Scotia, New York 12302

Prepared for:

Air National Guard Headquarters
3500 Fetchet Avenue
Andrews Air Force Base, Maryland 20762-5157

Prepared by:

Earth Tech, Inc.
40 British American Boulevard
Latham, New York 12110

April 2007

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LIST OF ABBREVIATIONS AND ACRONYMS

AB	Ambient Blank
ANG	Air National Guard
ASTM	American Society for Testing and Materials
cc	Cubic Centimeter
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Certified Laboratory Protocol
CoC	Chain-of-Custody
DI	Deionized
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved oxygen
DOD	Department of Defense
DTW	Depth To Water
DQO	Data Quality Objective
EB	Equipment Blank
ERP	Environmental Resources Program
ERPIMS	Environmental Resources Program Information Management System
FID	Flame Ionization Detector
FS	Feasibility Study
FFS	Focused Feasibility Study
FSP	Field Sampling Plan
GC	Gas Chromatograph
HHRA	Human Health Risk Assessment
IDW	Investigation Derived Waste
IRA	Interim Removal Action
LNAPL	Light Non-Aqueous Phase Liquid
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NTU	Nephelometric Turbidity Unit
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OD	Outside Diameter
ORP	Oxidation Reduction Potential
PET	Polyethylene
PID	Photoionization Detector
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
OVA	Organic Vapor Analyzer

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

RBC	Risk-based Concentration
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SANG	Schenectady Air National Guard
SARA	Superfund Amendments Reauthorization Act
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

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1.0 INTRODUCTION

A Field Sampling Plan (FSP) presents, in specific terms, the requirements and procedures for conducting field operations and investigations. This FSP was produced in conjunction with the Interim Remedial Actions (IRAs) and a Focused Feasibility Study (FFS) Work Plan at the Schenectady Air National Guard (SANG) Base. The purpose of this FSP is to ensure (1) the data quality objectives specified for this project are met, (2) the field sampling protocols are documented and reviewed in a consistent manner, and (3) the data collected are scientifically valid and defensible.

This FSP is required reading for all staff participating in the work effort. The FSP will be in the possession of field teams performing the field work. All contractors and subcontractors will comply with the procedures documented in this FSP in order to maintain comparability and representativeness of the collected and generated data.

Earth Tech will control the distribution of the FSP to ensure that the current and correct version is being used. A sequential numbering system will be used to identify copies of the FSP. Controlled copies shall be provided to applicable ANG managers, regulatory agencies, remedial project managers, project managers, and quality assurance (QA) coordinators. Whenever revisions are made or addenda added to the FSP, a document control system will be put into place to assure that all parties holding a controlled copy of the FSP receive the revisions/addenda and that outdated material is removed from circulation. The document control system does not preclude making and using copies of the FSP; however, the holders of controlled copies are responsible for distributing additional material to update any copies within their organizations.

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2.0 PROJECT BACKGROUND

The SANG Base is located in the southeast portion of Schenectady County Airport (SCA) in Scotia, New York. Since the 1950s, the Base has operated an array of military aircraft under numerous assignments. These have included the B-6, C-47, the C-97A and C-97G Stratocrusiers, various models of the C-130 Hercules, F-94 Starfire jets, P-47 Thunderbolt, P-51 Mustang, and the T-6. In 1991 the unit was redesignated to the 109th Airlift Wing and has since continued operations of the C-130H Aircraft.

The Department of Defense (DOD) has initiated the Environmental Restoration Program (ERP) for evaluating suspected problems associated with historic waste disposal and spill sites at DOD facilities. As part of this program, three sites on the Base have been evaluated: Site 2, the Drum Storage Area; Site 3, the Drum Burial Area; and Site 6, the Suspected Spill Area. Based on the results of a Remedial Investigation (RI) performed in 2000 (ANEPTEK, 2000), the New York State Department of Environmental Conservation (NYSDEC) concurred that No Further Action was warranted at Site 2 (NYSDEC, 2000). However, the two sites being addressed are Site 3, located in the southeast corner of the Base near the former sewage treatment facility, and Site 6 located upgradient from Site 3 (Figure 1-1 of the work plan).

In accordance with the goals and objectives of the ERP, Earth Tech has been contracted by the ANG/CERV to perform IRAs and a FFS at the 109th Airlift Wing, Schenectady ANGB in Scotia, New York, under Contract Number DAHA92-02-D-0012, delivery order 0062. The IRAs and FFS will be performed in accordance with federal guidelines of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments Reauthorization Act (SARA). This FSP presents the requirements and procedures for conducting field operations and investigations.

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3.0 PROJECT SCOPE AND OBJECTIVES

3.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are quantitative and qualitative goals that specify the amount and quality of data to be collected to support the decision-making process during the IRAs and FFS field work.

3.2 SAMPLE ANALYSIS SUMMARY

The analyses performed on a sample will depend on the sample media, the manner in which the sample was collected, and the purpose of collecting the sample. Table 3.2-1 summarizes the proposed laboratory analyses, methods, number of samples, trip blanks, and field duplicates for each sampling method/media.

In general, soil/sediment samples will be analyzed for the Target Analyte List (TAL) of Volatile Organic Compounds (VOCs) and TAL-Semi-Volatile Organic Compounds (SVOCs). Groundwater samples collected from monitoring wells will be analyzed for TAL-VOCs and natural attenuation parameters. Water samples collected to discharge treated groundwater into the sanitary sewer will be analyzed for VOCs, SVOCs, Priority Pollutant List (PPL) of metals, PCBs, cyanide, total suspended solids, pH and phenolic compound.

Waste characterization samples of all materials requiring off-site disposal may be analyzed according to the United States Environmental Protection Agency (USEPA), Toxicity Characteristic Rule of March 29, 1990 [TC29] (includes TAL-VOCs, TAL-SVOCs, PPL metals, Pesticide/Herbicide, Polychlorinated Biphenyls, and physical characteristics), based on the requirements of the selected disposal facility. The number and frequency of these samples will be contingent on the 6 NYCRR Part 360 Permit requirements of the selected disposal facility and ANG guidance.

All samples will be analyzed using US EPA *Contract Laboratory Program* (CLP) methods and/or SW-846 (“*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods”)* methods.

Quality Assurance/Quality Control (QA/QC) samples will be collected in accordance with the approved the Quality Assurance Project Plan (QAPP). A Draft QAPP is included in Appendix C of the Work Plan. In addition to the environmental media samples, the following QA/QC samples will be collected:

- Trip Blanks
- Duplicate Samples
- Equipment Blanks
- Matrix Spike/Matrix Spike Duplicate (MS/MSD)
- Ambient Blanks

A detailed discussion of QA/QC sampling methods, procedures, frequency, and usage is included in the QAPP. A summary of the estimated number of samples to be collected and analyses to be conducted is presented in Table 3.2-1.

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Table 3.2-1
Sample Analysis Summary

Analysis	Method	Number of Samples								Total Number of Samples
		Media Samples				QA/QC Samples				
		Groundwater		Soil/Sediment		Equip Blanks	MS/MSD	Trip Blanks	Duplicates	
Contaminants		**#**	**SDGs**	**#**	**SDGs**	**#**	**#**	**#**	**#**	
TAL-VOCs	SW8260B	65	5	38	4	4	9	10	9	135
TAL-SVOCs	TAL-SVOCs	3	1	30	4	4	5	na	5	47
PPL - Metals	SW6010B/ SW7060A/ SW7471	5	1	0	0	1	1	na	na	8
Waste Characterization	TC 29	na	na	9	na	Na	na	na	na	9
Natural Attenuation Parameter										
Total Organic Carbon	EPA Method 415.1	48	5							48
Chloride	EPA Method 330.4	48	5							48
Nitrate	EPA Method 300	48	5							48
Sulfate	EPA Method 300	48	5							48
Alkalinity	EPA Method 310.1	48	5							48
Field Parameters (e.g., DO, conductivity, pH, turbidity, Fe^{2+})	Field Measurements	65	na							48
Biological Parameters										
DNA	Sp.specific	48	4							48

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3.3 FIELD ACTIVITIES

The field sampling activities to be conducted primarily consist of soil and groundwater sampling to confirm completion of removal actions, characterize waste materials for off-site disposal, evaluate baseline geochemical conditions, and evaluate the efficacy of enhanced dechlorination of groundwater. All planned field activities are summarized in Table 3.3-1.

Table 3.3-1
Field Activities

Activity	Estimated # Samples if any
Conduct a utility clearance survey to ensure that all utilities, underground storage containers, and other subsurface hazards are accurately located and marked.	
Collect baseline GW samples and water levels from existing well network.	12 GW
Mobilize and prepare all work zones, staging areas, engineering controls as needed.	
Excavate soils from Site 6 and stage, collect post-excavation samples. Evaluate results, excavate additional materials as needed and resample as needed, collect waste characterization samples for all waste soil stockpiles	16 post-ex soil 4 WC (1 per 1000 yards)
Dewater excavation and treat groundwater with temporary water treatment system. Sample treated groundwater and discharge to City of Schenectady Water Pollution Control Plant (WPCP)	1 per 20,000 gallons treated water
Prepare substrate solution and infuse in open Site 6 excavation.	
Construct infusion gallery in Site 6 excavation.	
Remove Site 6 soils for off-site disposal and backfill Site 6 excavation.	
Install 8 new groundwater monitoring wells.	
Excavate hotspots in Site 3, evaluate anomalies and stage, collect post-excavation samples. Evaluate post-excavation sampling results, excavate additional materials as needed and resample as needed. Collect waste characterization of staged soils.	15 post-ex soil 2 WC
Remove Site 3 soils for off-site disposal and backfill Site 3 excavations.	
Excavate drainage swale adjacent to Site 3. Evaluate post-excavation sampling results, excavate additional materials as needed and resample as needed. Collect waste characterization profile samples of soil/sediment from Site 3 drainage swale.	18 post-ex soil 1 WC
Demobilize and restore site.	
Collect 30 day post-infusion GW samples.	12 GW
Collect 60 day post infusion GW samples.	12 GW
Collect 180 day post-infusion GW samples.	12 GW

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4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Earth Tech will manage all field activities, including the sample collection, data analysis, site characterization, and reporting. The project team will be comprised of Earth Tech personnel and Earth Tech approved subcontractors. The Earth Tech team has identified key management and technical personnel who will participate in this project. Guidance will be provided to individuals to ensure that overall project goals and objectives are met. Additional technical staff will be available throughout the course of the project if needed. Figure 4-1 presents the project organization chart.

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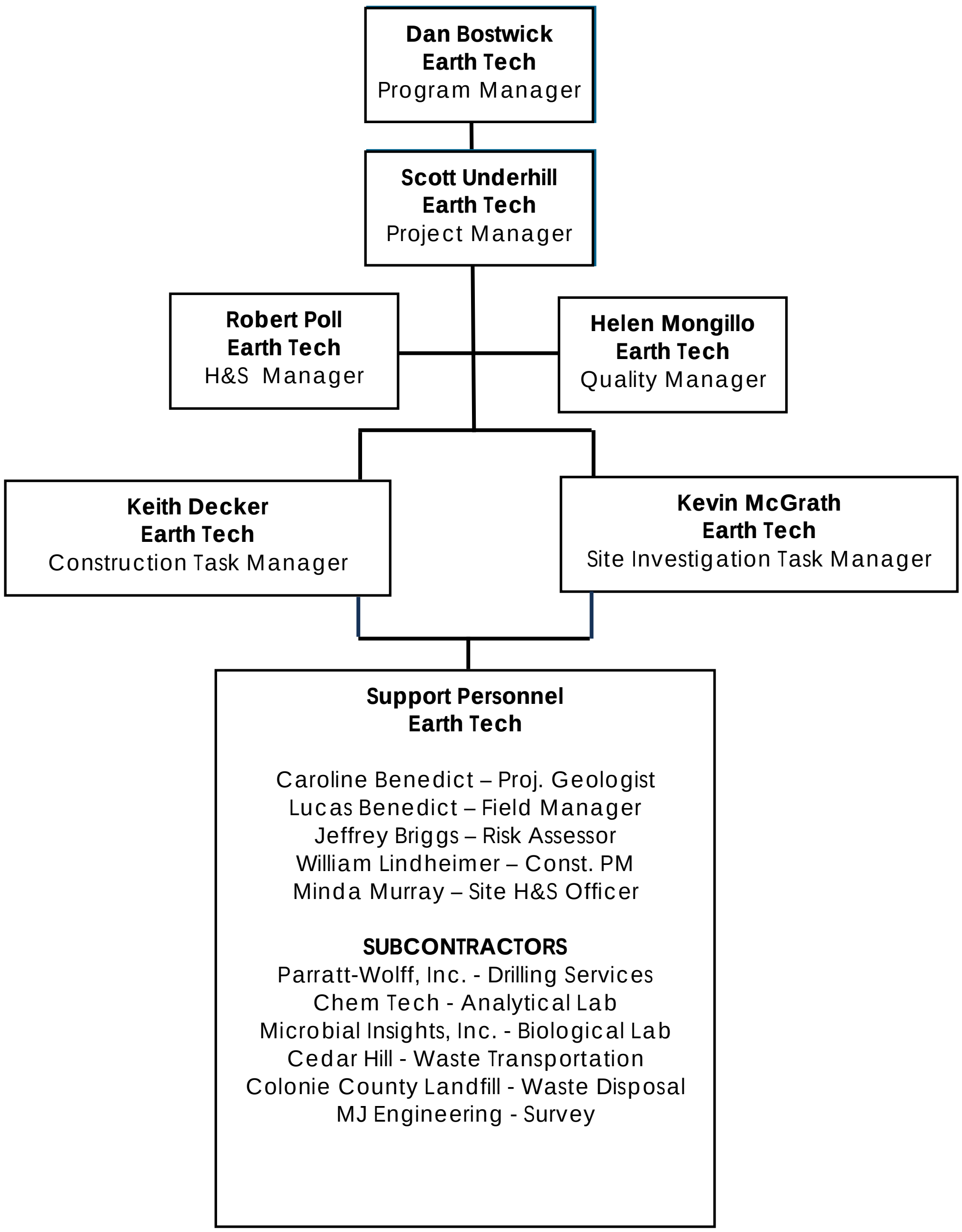
Figure 4-1
Project Organization Chart



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5.0 FIELD OPERATIONS

The following field activities will be performed in completion of the Work Plan:

- Mobilization and Site Preparation
- Soil Borings, Monitoring Well Installation, and Development
- Excavation
- Equipment Decontamination
- Surveying
- Waste Handling, Transport, and Disposal

The following sections specify the methods, procedures, and materials (where applicable) to be used to perform these identified field activities.

5.1 MOBILIZATION AND SITE PREPARATION

5.1.1 Permits

Permits required for the IRAs include the SANG digging permit to perform intrusive work at Sites 3 and 6 and a temporary discharge permit to discharge treated groundwater to the City of Schenectady WPCP. The digging permit will be obtained in conjunction with the utility clearance markout described in Section 5.1.2. The temporary discharge permit has been obtained and is presented in Appendix D of the Work Plan.

5.1.2 Utility Clearance

Prior to conducting any intrusive activities, base personnel will identify and demarcate any owned (or leased) utilities that may transect the areas of intended work In the event that a utility cannot be located but is known or suspected to transect the areas of work, a utility locator service provider may be necessary to properly locate the underground facilities and minimize potential hazards during the site work. An Underground Facilities Protective Organization (UFPO) will be contacted and provided an address, location map, and scope of work for all intrusive activities. The UFPO covering New York State is DigSafetlyNY at 1-800-962-7962.

The UFPO will notify the facility owners, typically a utility, cable or telephone company, or municipality with underground water or sewer lines, or traffic control cables. The facility owner will evaluate the plan and determine their involvement. If the owner believes their facilities are at risk, they can stake or mark the area, or call a meeting to further discuss the proposed excavation. Regardless, owners are required to notify excavators within two full working days of the notification date. Excavators can not start digging and must wait until all utilities identified by the UFPO contact them to indicate they have no facilities affected by the intended work, or have demarcated all of their utilities in the area that may be impacted.

5.1.3 Site Preparation

Included in the HASP in Appendix C of the work plan is a general plan for the layout of work zones in accordance with 129 CFR 1910. A detailed site layout plan will be prepared and submitted to ANG for approval prior to mobilization. The site-layout will include, but not limited too, proposed soil stockpile areas, engineering runoff controls, containerized waste storage areas, equipment and material storage areas, decontamination facilities, ingress and egress routes, portable restrooms, and emergency stations.

The locations of all proposed hotspot and geophysical anomaly excavations will be pre-located and staked/flagged along with the presumed limits of the Site 6 excavation area using a portable GPS array.

5.1.4 Site Security Fence

A 6-foot high chain link fence will be installed around the perimeter of the site work where the current chain link fence will need to be removed. Placement of the chain link fence will be coordinated with SANGB security personnel.

5.1.5 Equipment Reduction Pad

An equipment contamination reduction pad, with a minimum size of 20 feet by 20 feet, will be constructed and maintained inside the Contamination Reduction Zone. The interior of the pad will be sloped to an internal sump so that the wash water and sediment can be collected and removed for disposal. A high-pressure washer will be maintained to clean all vehicles and equipment exiting the Exclusion Zone.

A submersible pump will be placed in the sump to transfer the decontamination water via hose to a frac tank. The equipment contamination reduction pad will be covered with polyethylene sheeting when not in use. The sheeting will be secured with sandbags. At the completion of the remediation project, the sand, stone, and sediment will be sampled, analyzed and disposed of at a permitted facility.

The equipment contamination reduction pad (See Figure 4 Section A-A) will be constructed as follows: the existing ground will be graded and compacted as required; medium sand will be placed over the proposed area; 10-inch x 10-inch timbers, held in place by #5 rebar, will be placed around the perimeter; sand will be bermed around the inside of the timbers to protect the liner a minimum 30-mil thick high density polyethylene liner will be placed over the sand and timbers; liner will be held will be secured by nailing wooden battens on the outside of the timbers; two inches of medium sand will be placed above the liner; a sump will be constructed in the lowest area by using a slotted PVC pipe and will be set in stone to collect water, remaining area within the timbers will be filled with course stone, and a stone or earthen ramp will be constructed to allow equipment to drive onto the pad. A cover of 6-mil polyethylene sheeting will be placed over the equipment contamination reduction pad. The cover will be secured with sandbags.

5.1.6 Stockpile Management Area

Stockpile management areas will be prepared for stockpiling excavated soils. The areas will be prepared as follows: the existing ground surface will be graded and compacted as required, a sump will be constructed in the lowest area; medium sand will be placed over the proposed storage area; 8-inch X 8-inch timbers, held in place by #5 rebar, will be placed around the perimeter; sand will be bermed around the inside of the timbers to protect the sheeting; a minimum, 30-mil thick reinforced polyethylene sheeting will be placed over sand and timbers; sheeting will be secured by nailing wooden battens on the outside of the timbers; and three inches of medium sand will be placed on the sheeting. A cover of 6-mil thick polyethylene sheeting will be placed over the stockpile management area. The cover will be secured with sandbags.

5.1.7 Erosion and Sediment Control

Siltation fence and hay bails will be placed along the drainage ditch and downgradient of Site 3. Additional erosion and sedimentation controls for surface water runoff (i.e., haybales and or earth berm) may be used to prevent runoff from entering open excavations or interfering with construction activities. The integrity of the siltation fence and earth berm shall be checked daily.

5.2 SOIL BORING, MONITORING WELL INSTALLATION AND DEVELOPMENT

An accredited geologist, hydrogeologist, geotechnical engineer, or person certified by the American Institute of Hydrology, American Institute of Professional Geologists, or the National Ground Water Association as a Certified Ground Water Professional shall provide technical oversight during all drilling, soil borings, and monitoring well construction. The field geologist shall affix his/her signature to all drilling logs, as-built well construction diagrams, lithologic logs, sampling records, and similar documents. Shallow overburden monitoring wells shall be screened across the water table. The length of the screen shall be such seasonal water table fluctuations shall not cause water levels to rise above or fall below the screened interval. If necessary, bedrock monitoring wells will be screened across all identified water bearing fractures. Ambient air will be monitored during all drilling activities using either a PID or FID.

5.2.1 General Drilling/Logging Procedures

The location and orientation of the drilling rig and ancillary equipment will be determined jointly by the drilling subcontractor and the site health and safety coordinator. Boreholes will be drilled using either rotary or hollow stem auger drill rig. Both drill rigs will employ a down hole hammer to collect split spoon samples for logging and sampling purposes.

It is anticipated that Hollow Stem Augers (HAS) will be used to advance monitoring well pilot holes through the overburden into the sapprolitic bedrock until refusal. If, in the opinion of the field geologist, refusal is caused by competent bedrock, the boring will be discontinued at that point. However, Mud Rotary drilling may be needed to complete the borehole to the base of the sapprolite. Bedrock drilling will utilize rock coring techniques.

5.2.1.1 Hollow Stem Auger

Overburden drilling with HSA will be performed in general accordance with ASTM Standard D5784-95(2006): *"Standard Guide for Use of Hollow-Stem Augers for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices."*

An auger drill rig will be employed for borehole drilling in unconsolidated formations. Auger drills find their main application in soil and unconsolidated ground water investigations. A top driven rotary machine operates the augers. Cuttings are carried to the surface on the helical flights. Hollow stem augers are a continuous flight auger, which has a hollow center tube. They are normally used with a plug bit held in place by a secondary internal rod string. Augers are rotated to the depth of interest, the central plug is withdrawn and sampling methods are employed to suit the geological conditions. The advantages in using an auger rig are low equipment and operating costs, and fast penetration in suitable terrains. The disadvantages are poor penetration in coarse or consolidated material, and difficult drilling in heaving or dense fine-grained sands.

5.2.1.2 Rotary Drilling

Rotary Drilling will be conducted in general conformance with ASTM Standard D5783-95(2006): *"Standard Guide for Use of Direct Rotary DRILLING with Water-Based DRILLING Fluid for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices"*.

A rotary drill rig will be employed for the deeper boreholes that may penetrate more consolidated material. Rotary drilling is any form of drilling which makes a hole by turning a bit on the bottom of the hole as opposed to the up and down action of percussion drilling. The rotary driller uses fluid (air, water or mud) circulation to clear the cuttings from the borehole. The rotary drill cuts by rotating the bit while pressing the bit down into the bottom of the borehole. As the bit cuts, it must be fed down to maintain the pressure. The cutting bit is rotated to the depth of interest, the bit and rods are withdrawn and sampling methods are employed to suit the geological conditions. The advantages in using a rotary rig are good penetration in consolidated material and the ability to drill very deep boreholes. The disadvantages are higher equipment and operating costs and slower rate of drilling.

5.2.1.3 Rock Coring

Rock Coring for bedrock well installation will be conducted in general accordance with ASTM Standard D2113-06: *"Standard Practice for ROCK CORE Drilling and Sampling of ROCK for Site Investigation"*.

Conventional HSA and rotary drilling will be used to advance the borehole two feet below the top of competent bedrock and a steel protective casing installed to isolate the bedrock from the overlying overburden water bearing zone. Then diamond toothed drilling core spun at high speed will be advanced into the bedrock and four-foot drill cores recovered and inspected for evidence of water bearing fractures.

5.2.1.4 Logging Procedures

The following information will be documented on a borehole log form, an example of which can be found in the attachments section:

- Boring or well identification, project name and site if applicable
- Location in relation to an easily identifiable landmark
- Names of drilling contractor, rig model and drilling method
- Logging geologist and driller
- Start and finish dates and times
- Borehole diameter and depths if different diameters are used downhole
- Amount and types of drilling fluids and depths at which they were used
- Depth at which drilling fluids were lost and the amount of fluid lost
- Changes in the properties of drilling fluids
- Lithologic descriptions and depths of lithologic boundaries
- Depth at which saturated conditions were first encountered
- Sample numbers, sampling-interval depths, times and required analysis
- Zones of caving or heaving
- Drilling rate and drill rig reactions (e.g., chatter, rod drops, bouncing)

In addition to the above, the following information shall be recorded when rock core samples are collected:

- Depth interval and top and bottom of each core (marked on the core box)
- Percentage of core recovered
- Number of fractures per foot
- Angle of fractures relative to the core axis
- Breaks due to coring and core handling (distinguish from natural fractures)

A split spoon sample for lithologic description will be obtained at each change in lithology or at five-foot intervals, whichever is less, or at the discretion of the field geologist.

5.2.2 Drilling Requirements

All drilling and well installations shall conform to state and local regulations, and the contractor shall obtain and pay for all permits, applications, and other documents required by state and local authorities. The location of all borings shall be coordinated in writing with the Base civil engineer or equivalent before drilling commences.

Drilling rigs will be cleaned and decontaminated before any drilling operation can commence. The rig shall not leak any fluids that may enter the borehole or contaminate equipment that is placed in the hole. The use of rags or absorbent materials to absorb leaking fluids is unacceptable. The only acceptable drilling fluids are air, water, and mud. The air used shall be filtered to remove organic vapors, and if water is used, the prime contractor shall provide chemical analyses of the water assuring its purity. The water quality shall be monitored daily for analytes of concern. The mud used shall be 100 percent sodium bentonite and the contractor shall provide chemical analyses of any drilling mud additive or substitute (e.g., foam, biodegradable material, etc.) proposed for use. The additives or substitutes for drilling will be tested for all analytes of concern at the site and must be approved prior to drilling mobilization.

Drilling lubricants shall not introduce or mask contaminants at the site. The contractor shall provide chemical analyses of all lubricants proposed for use in the boring prior to the start of drilling. Chemical detection limits will be equivalent to those used in analyzing the project ground-water samples. Lubricants with constituents that are toxic or that increase, decrease, or mask the target chemical species of the investigation shall not be permitted. The contractor must provide the analysis results prior to drilling mobilization.

The contractor will dispose of all trash, waste grout, cuttings, and drilling fluids as coordinated with the Base civil engineer or representative. When installing wells through more than one water-bearing zone or aquifer, the contractor shall take measures to prevent cross-connection or cross-contamination of the zones or aquifers.

5.2.3 Borehole Requirements

Borehole diameters shall be at least four inches larger than the outside diameter of the casing and well screen. If the hollow stem auger drilling method is to be used the inside diameter of the auger shall be at least four inches larger than the outside diameter of the casing and well screen.

A completed monitor well should be straight and plumb. The monitor well should be sufficiently straight to allow passage of pumps or sampling devices. The monitor well will be plumb within one degree of vertical where the water level is greater than 30 feet below land surface unless otherwise approved. The contractor shall use a single-shot declination tool to demonstrate plumbness. Monitoring wells not meeting straightness or plumbness specifications must be redrilled and/or reconstructed.

5.2.4 Well Casing Requirements

The following requirements apply to all casings to be installed at this site:

- All casing shall be new, unused, and decontaminated Schedule 40 polyvinyl chloride (PVC).
- Glue shall not be used to join casing. Casing should be joined only with compatible wells or couplings that will not interfere with the planned use of the well.
- All PVC shall conform to the ASTM Standard F-480-88A or the National Sanitation Foundation standard 14 (Plastic Pipe System).
- The casing shall be straight and plumb within the tolerance stated for the borehole.
- The driller shall cut a notch in the top of the casing to be used as a measuring point for water levels.

5.2.5 Well Screen Requirements

The following requirements apply to all well screens to be installed at this site:

- All requirements that apply to casing will also apply to well screen with the exception of those pertaining to strength.
- Monitoring wells shall not be screened across more than one water-bearing unit.
- Screens shall be factory slotted or wrapped.
- Screen slots shall be sized to prevent 90% of the filter pack material from entering the well. For wells where no filter pack is used the screen slot size shall be selected to retain 60% to 70% of the formation materials.
- The bottom of the screen is to be capped, and the cap will be joined to the screen via threads.
- Depending on the thickness of the confining layer, the screen length could vary between 5 to 10 feet for the intermediate zone. As far as the deep zone is concerned the screening length is 10 feet.

5.2.6 Annular Space Requirements

The following requirements outline the elimination of annular space in monitor well bore holes:

- The annular space will be filled with a filter pack, bentonite seal, and casing grout between the well string and the borehole wall.
- Any drilling fluids shall be thinned with potable water of known, acceptable quality to a density less than 1.2-g/ml (10-lbs/gal) before the annular space is filled. A mud balance or Marsh Funnel shall be kept on site to allow measurement of drilling fluid density.
- As the annular space is being filled, the well string shall be centered and suspended such that it does not rest on the bottom of the hole. For wells greater than 50-feet deep, at least two centralizers should be used – one at the bottom of the screen and the other at the top of the screen. Additional centralizers may be used if necessary.

5.2.7 Filter Pack Requirements

The following requirements apply to the installation of filter pack:

- The filter pack shall consist of silica sand or gravel and shall extend from the bottom of the hole to at least two feet above the top of the well screen.
- The filter pack shall be sounded to verify its depth during placement.
- The contractor shall record the volume of the filter pack placed in the well.
- Potable water may be used, with the approval of the regulatory agency providing oversight, to emplace the filter pack so long as no contaminants are introduced.
- The well shall be surged with a surge block for ten minutes after the filter pack is emplaced.
- The top of the sand pack shall be sounded to verify its depth after surging. Additional filter pack shall be placed as required to return the level of the pack to two feet above the screen.
- Surge the well for five minutes. Again, place additional filter pack as required to bring its level to two feet above the screen.
- If gravel is used, six inches of coarse sand shall be placed on top of the gravel.

The following requirements apply to the filter pack material:

- The filter pack material shall be clean, inert, and well-rounded and shall contain less than two percent flat particles. The sand or gravel shall be certified free of contaminants by vendor or contractor.
- The filter pack shall have a grain size distribution and uniformity coefficient compatible with the formation materials and the screen.
- The filter pack shall not extend across more than one water-bearing unit.

5.2.8 Bentonite Seal Requirements

The bentonite seal requirements that shall be followed are the following:

- The bentonite seal shall consist of at least two feet of bentonite between the filter pack and the casing grout.
- Only 100% sodium bentonite is to be used, in the form of chips or powder.
- Bentonite chips may be hydrated with distilled water after placement. In deep wells, powdered sodium bentonite will be mixed at the surface to a lump free consistency and emplaced with a side discharge tremie pipe.
- Bentonite chips will be allowed to hydrate for one hour prior to grout emplacement.
- Bentonite slurry will be allowed to set for at least 24 hours prior to grout emplacement.

5.2.9 Casing Grout Requirements

The casing grout requirements are the following:

- Casing grout shall extend from the top of the bentonite seal to ground surface.
- The grout shall be mixed in the following proportions:
  - 94-pounds of neat Type I Portland of American Petroleum Institute Class A cement.
  - Not more than 4-pounds of 100 percent sodium bentonite powder.
  - Not more than 8-gallons of potable water.
- All grout will be pump tremied using a side-discharge tremie pipe. Pumping shall continue until 20 percent of the grout has been returned to the surface. The 20 percent return is not necessary for wells where the bentonite seal is visible and within 30-feet of the land surface, provided that the tremie pipe is pulled back as the grout is emplaced.

5.2.10 Surface Completion Requirements

The following procedure applies to the surface completion of monitoring wells.

1. Cut the casing about three inches below the land surface and provide a water-tight casing cap to prevent surface water from entering the well.
2. A small diameter (e.g., 1/16-inch) vent hole shall be placed in the upper portion of the casing, or a ventilated well cap shall be used.
3. A freely draining valve box with a locking cover should be placed over the casing. The top of the casing shall be at least one foot above the bottom of the box.

4. The valve box lid will be centered in a two-foot by two-foot, four-inch thick concrete pad that will be poured around the valve box. The pad should slope away from the box at 1/4 inch per foot.
5. The identity of the well will be permanently marked on the valve box lid and the casing cap.
6. Where heavy traffic may pass over the well, the concrete pad and valve box/lid assembly will be constructed to meet the strength requirements of surrounding surfaces.

5.2.11 Monitor Well Construction Documentation

Sample monitor well construction logs can be seen in the attachments section.

5.2.12 Monitor Well Development

Monitoring wells shall be developed based upon the following requirements:

- Newly installed monitoring wells shall be developed no sooner than 24-hours after installation to allow for grout curing.
- All drilling fluids used during well construction shall be removed during development.
- Wells shall be developed using surge blocks and bailers or pumps. Wells shall be developed until:
  - The suspended sediment content of the well water is less than 0.75-mL/L as measured in an Imhoff cone.
  - The turbidity remains within a 10 nephelometric turbidity unit (NTU) range for at least 3 readings.
  - The stabilization criteria outlined in Section 6.2.1 (Low Flow Groundwater Sampling) step 11 are met.
- Discharge water color, odor, and volume shall be documented.
- No detergents, soaps, acids, bleaches, or other additives shall be used to develop a well.
- All development equipment shall be thoroughly decontaminated.

A well development form can be found in the attachments section.

5.2.13 Borehole and Monitor Well Abandonment

Boreholes that are not converted to monitoring wells shall be abandoned in accordance with applicable federal, state, or local requirements. Abandoned holes will be filled in with either solid sodium bentonite chips or a mud/slurry. If a slurry is used, a mud balance and/or Marsh Funnel shall be used to ensure the density (lbs/gal) of the abandonment mud mixture conforms to the manufacturer's specifications. The slurry will be emplaced from the bottom to the top of the hole using a tremie pipe.

All abandoned boreholes will be checked 24 to 48 hours after mud/solid bentonite emplacement to determine whether curing is occurring properly. More specific curing specifications may be recommended by the manufacturer and shall be followed. If settling has occurred, a sufficient amount of mud/solid bentonite shall be added to fill the hole to the ground surface. Surface completions shall match their surroundings.

5.3 EXCAVATION AND RESTORATION

Excavation activities will be phased to minimize potential cross-contamination of work zones. Since the Site 3 removal action is likely to require the smallest amount of soil removal, and has sufficient area for stockpiling all excavated soils to be removed from all areas, work will commence in Site 3, until all excavation work is completed, then relocated to Site 6 and conclude with excavation of the drainage swale, if necessary.

Excavation in Site 3 will commence at the most upgradient location and proceed successively downgradient. Excavation in Site 6 will commence at the most upgradient location in Site 6 and proceed in a series of 2 foot lifts until the entire proposed limits of excavation had been achieved down to the existing water table. Excavated soils will be screened with a portable PID not less than once for each 10 buckets removed. Soils will be segregated based on the PID results in accordance with the work plan and staged in the appropriate staging areas based on the results of field screening.

Excavation of any soils and sapprolitic bedrock will be conducted in one lift commencing at the upgradient most point in the excavation and proceeding downgradient. Soils/weathered rock will be dragged back toward the down gradient most limit of excavation and left in the excavation until drained of free water before staging in the stockpiled soils area(s).

5.4 GROUNDWATER, STORMWATER, AND WASTEWATER MANAGEMENT

The degree of groundwater infiltration into the excavation will depend on the influx of groundwater and runoff at the time of remediation. Also, groundwater present within the soil column will need to be managed as part of the remediation effort. Dewatering activities will primarily address the volume of water present within the excavation area and, to a lesser extent, upwards groundwater flow and precipitation.

Earth Tech will use sandbags, hay bales and siltation fencing readily available to construction berms around the excavations when the need arises to control rain water entering the excavation in order to accomplish the goals of the Work Plan.

A modular temporary water treatment system to treat groundwater that is encountered during remediation activities may be used. Treated groundwater will be discharged to the City of Schenectady's Water Pollution Control Plant (WPCP). The work shall consist of mobilizing the groundwater treatment system and setting the system up adjacent to the excavation areas. Sources of water may include, but not limited to:

- Water from dewatering of excavation area;
- Groundwater from excavation(s);
- Storm water run-off from contaminated areas; and,
- Decontamination water and water from other miscellaneous sources.

Prior to performing any excavations, a groundwater treatment system will be installed to treat contaminated groundwater collected from the areas listed above. Treated groundwater will be stored and sampled for the analyses required by the City of Schenectady's Temporary Water Discharge Permit. If the sample results show levels are below the required discharge limitations, then the treated groundwater will be discharged directly to the sanitary sewer.

The system may include (but not limited to) the following major components:

- Bag Filters;
- Activated Carbon;
- Storage Tank(s); and
- Transfer pumps

5.5 EQUIPMENT DECONTAMINATION

All non-dedicated reusable equipment that can potentially contaminate samples must be decontaminated before it can be used. This includes but is not limited too: split spoons, augers, drill bits, rods, and excavation machinery.

All equipment entering the site for the first time will have been decontaminated prior to mobilization.

All downhole equipment or excavation machinery will be steam cleaned prior to each use at a new location, as necessary during operations based on the determination of the site manager, and prior to final demobilization.

Equipment decontamination will be performed in the designated decontamination area on a prepared pad as specified in the site layout plans. All decontamination water will be containerized in properly labeled 55-gallon DOT drums and staged on site pending disposal.

The following process will be used for decontaminating hand-held equipment:

1. Wearing nitrile gloves, remove any large debris from the equipment (e.g., clumps of mud). Inspect the equipment for damage. Disassemble the piece of equipment if it has multiple components.
2. Wash and scrub the equipment in a detergent solution such as Alconox or Liquinox and water. Take care to clean all crevices and other areas that can trap and hold material.
3. Rinse the equipment with distilled water.
4. Allow the equipment to dry. Reassemble if necessary. Reuse immediately or wrap in foil or seal in plastic baggie for storage until next usage.

5.6 SURVEYING

A licensed professional land surveyor will survey all the locations of all boreholes, key construction features of newly installed monitoring wells, and the final limits of excvations. The data will be delivered to Earth Tech in an electronic format and used to generate RI/FS report figures, as built drawings, and any other maps, which may be required. Survey coordinates will be reported in the New York State Plane NAD83 coordinate system.

5.7 WASTE HANDLING

All excavated soils, investigation derived waste, containerized wastes, purge water, and decontamination water requiring off-site disposal will be handled in accordance with the specifications in detailed in Section 7.0 (Waste Management Plan).

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6.0 ENVIRONMENTAL SAMPLING

6.1 SOIL/SEDIMENT SAMPLING

During the performance of the activities detailed in the Work Plan, soil and/or soil/sediment samples will be collected for evaluation of the drainage swale, confirmation of completion of removal actions and waste characterization profiling to determine applicable disposal options. All soil sampling will be performed using dedicated disposable hand sampling tools. The following sections detail the specific sampling procedures used for soil sampling based on the purpose of the sample and type of analysis.

6.1.1 Drainage Swale

Five grab soil samples were collected at identified upgradient outfalls discharging to the drainage swale abutting Site 3 as approved by NYSDEC during the site kick-off meeting. Dedicated disposable hand-held sampling tools were used to collect and soil/sediment that can be removed within reach of the mouth of the pipe, or from the surface of the swale immediately below the outfall.

6.1.2 Post-Excavation Confirmation Samples

All post-excavation soil samples collected for VOC analysis will be collected using EnCore® dedicated disposable sampling devices recommended by ANG guidance. The following procedures will be used to collect all post-excavation soil samples collected

1. Select location of sample collection points.
2. Clear loose soil away from surface with straight edge of dedicated disposable sampling spoon/trowel to gently remove approximately 4-inches of surface and create a shallow depression in the natural soil of the sidewall or base of the excavation.
3. Remove a new encore sampler from the sealed shipping package (carefully so as not to break the resealable ziplock bag)
4. Hold coring body and push plunger rod down until small o-ring rests against tabs. This will assure that plunger moves freely.
5. Depress locking lever on En Core T-Handle. Place coring body, plunger end first, into open end of T-Handle, *aligning the (2) slots on the coring body with the (2) locking pins in the T-Handle*. Twist coring body clockwise to lock pins in slots. Check to ensure Sampler is locked in place. Sampler is ready for use.
6. Turn T-Handle with T-up and coring body down. This positions plunger bottom flush with bottom of coring body (ensure that plunger bottom is in position). Using T-Handle, push Sampler into soil until coring body is completely full. When full, small o-ring will be centered in T-Handle viewing hole. Remove Sampler from soil. Wipe excess soil from coring body exterior.
7. Cap coring body while it is still on T-handle. Push cap over flat area of ridge. Push and twist cap to lock arm in place. Cap must be seated to seal sampler.

8. Remove the capped Sampler by depressing locking lever on T-Handle while twisting and pulling Sampler from T-Handle.
9. Complete Sample Identification Label on sampler bag
10. Attach completed label (from En Core Sampler bag) to cap on coring body.
11. Return Sampler to zipper bag. Seal bag and place in ice filled cooler for shipment to laboratory.
12. Record Sample identification on chain-of-custody.
13. Place labeled pin flag in sample location for subsequent survey.

For single point grab samples, one (1) EnCore® sample will be collected. For composite samples, one (1) encore sampler will be used for each sample point to be included in the composite and composited in the laboratory the under controlled conditions prior to analysis.

All post-excavation samples collected for SVOC will be collected using dedicated disposable sampling devices. The following procedures will be used to collect the samples.

For ALL:

1. Select location(s) of sampling point(s) for sample.
2. Clear loose soil away from surface with straight edge of dedicated disposable sampling spoon/trowel to gently remove approximately 4-inches of surface and create a shallow depression in the natural soil of the sidewall or base of the excavation.
3. Using cutting edge of tool, scoop out sufficient quantity of soil to fill an 8 oz soil jar.

For Composite samples only follow steps 4 -7:

4. Empty jar contents into a clean stainless steel mixing bowl.
5. Repeat steps 2-4 until all a subsample from all sampling points to be included in the composite sample have been collected in the mixing bowl.
6. Using the sampling tool, thoroughly homogenize the contents of the mixing bowl to the extent practical.
7. Divide content of mixing bowl into four approximately equal quadrants and remove approximately 2 ounces of soil from the center of each quadrant and place in the laboratory supplied 8 oz soil jar.

For ALL:

8. Wipe excess dirt from jar, cap, and affix sample identification label.
9. Place sample immediately in ice filled cooler.
10. Record Sample identification on chain-of-custody.
11. Place labeled pin flags in sample location(s) for subsequent survey.

6.1.3 Waste Characterization Profile Samples

Waste characterization samples will be collected from all excavated soil stockpiles for determination of disposal and/or reuse options. A minimum of one (1) 5-point composite sample will be collected from each soil stockpile. An additional 5-point composite sample will be collected for each 1,000 cubic yards (or fraction thereof) from each soil stockpile. Waste characterization samples will be collected following the same procedures used for collecting composite VOC and SVOC samples with the following changes.

1. Visually determine number of samples required based on approximate volume.
2. Visually divide (based on volume) stockpile into an equal number of parts
3. Visually divide each part into five equal subparts.
4. Remove 6-12 inches of material. at the center of each subpart
5. Collect EnCore® samples at each subpart collection point
6. Collect 2 8oz jars of soil at each subpart collection point for mixing
7. After mixing, fill 3 8oz jars for submission to the laboratory
8. Move to next part of stockpile. Repeat until entire stockpile pile has been sampled.

6.2 GROUNDWATER SAMPLING

Groundwater samples will be periodically collected from the newly installed monitoring wells and up to five existing on site wells. Groundwater samples will be analyzed to determine the concentrations of VOCs and natural attenuation parameters in the groundwater. The results will be used to evaluate the effects of the IRAs and the enhanced dechlorination treatment study.

Four rounds of groundwater samples are anticipated. A baseline sampling event using existing wells will be conducted prior to any excavation/removal actions. Additional rounds of sampling will be performed at scheduled intervals after the well installation and treatability study infusion phases. All groundwater samples will be collected using the low-flow sampling technique that is the preferred method per ANG guidance.

6.2.1 Low Flow Groundwater Sampling Procedures

The following equipment will be used to conduct low flow sampling:

- A bladder pump with Teflon or polyethylene (PET) bladders
- An air compressor and control unit to adjust the rate of pumping
- A water level indicator
- PET tubing for air input to pump and water discharge from pump
- A water quality meter
- A PID for detecting volatile compounds in the area surrounding the monitor well and at the well head upon opening

The PID and water quality meter shall be calibrated on a daily basis prior to sampling. Daily calibration checks will be conducted upon the completion of sampling each day. All calibration and calibration checks shall be documented on a calibration log form, which can be found in the attachment section. Equipment will also be calibrated as needed during the course of sampling. All equipment that is to be placed in a monitoring well (pump, water level indicator) must be thoroughly decontaminated before it is placed in the well. Disposable tubing will be used in order to avoid cross-contamination; tubing will be disposed of after each well is sampled. The following is the procedure for conducting low flow groundwater sampling:

1. Safety glasses and nitrile gloves must be worn while sampling. Any additional health and safety protocols specific to the site should also be followed.
2. Determine well location. Record the date, well identification, sampler name(s), well type (flush mount or stick up) and condition, equipment (pump, PID, water quality meter, water level indicator) model and serial number, and any notes about the well area on a sample collection form found in the attachments section and in the logbook (Section 8.1). Cover the area immediately surrounding the well with plastic to avoid potential contamination of the soil surface.
3. With plastic in place, remove the well cover and cap. Take ambient and well mouth readings with the PID. Record these readings on the sample collection form.
4. Using the water level indicator obtain the initial depth to water (DTW) of the well and the total well depth. Record these readings on the sample collection form and in the logbook.
5. Connect the compressor to its power source (generally, a vehicle battery). Connect the compressor to the control box with the supplied air hose.
6. Connect PET tubing to the pump for air supply and water discharge. The length of tubing should be great enough that the pump will be located near the lower portion of the screened interval of the well. The pump should always be placed at least one foot above the bottom of the well screen. Lower the pump slowly to the desired depth within the well. A string tied to the top of the pump and tied to a stationary object at the surface will hold the pump at the sampling depth.
7. Connect the air supply tubing to the control unit of the compressor.
8. Connect the water discharge tubing to the flow through cell of the water quality meter. Secure the water quality meter in an upright position. Run a length of tubing from the discharge of the water quality meter into a graduated purge water container.
9. Turn on the compressor and control box. Using the control box, adjust the flow-rate of the pump to minimize drawdown. A flow rate of <500mL per minute is optimum. The flow-rate should be determined by collecting purge water in a graduated cylinder for a period of one minute.
10. Turn on the water quality meter. The following parameters will be recorded:
    - Time of reading
    - Temperature (^{o}C)
    - pH
    - Dissolved Oxygen (DO) (mg/L)
    - Conductivity (mS/cm)
    - Oxidation Reduction Potential (ORP) (mV)
    - Turbidity (NTU)
    - Pump refill/discharge rate (from control box readout) (s/s)
    - Pump pressure (from control box readout) (psi)
    - Water level (feet below top of casing)
    - Volume of water purged (gallons)

Notes should be made regarding the clarity and odor of the water purged from the well. Any problems with equipment or adjustments made to the equipment should also be noted.

11. Readings shall be taken every 5-minutes at the beginning of the purge. As parameters begin to stabilize, the time between readings may be reduced to 3-minutes. The well shall be purged until the parameters have stabilized for three consecutive readings, and a minimum purge time of 40-minutes has been attained. Stabilization is defined according to the following criteria:
    - Temperature: +/- 0.5 ^{o}C
    - pH: +/- 0.1
    - DO: +/- 10%
    - Conductivity: +/- 3%
    - ORP: +/- 10 mV
    - Turbidity: +/- 10% (Three readings under 10-NTU considered ideal)
    - Water level: drawdown <0.33-ft is ideal. If the drawdown is excessive (e.g., 8-inches after several readings and still falling), the refill/discharge rate and/or pressure should be adjusted to allow recovery of the well. The pump settings should be adjusted until a rate that does not cause excessive drawdown is achieved. If it is not possible to achieve a steady water level, the well should be pumped dry, allowed to recharge, and sampled.
12. Once the well has stabilized samples can be collected. The following is the procedure for collecting samples:
    (a) Nitrile gloves shall be worn throughout the duration of sampling.
    (b) Have all sample bottles ready and labeled with a unique sample identifier as described in Section 6.5.3.2 (Groundwater Sample Identification). The date of sampling, sample time, sampler, and analysis required should be recorded on the labels, sample collection form and in the logbook.
    (c) While maintaining the purge flow rate, disconnect or cut the pump discharge tubing from the water quality meter. Water that has passed through the water quality meter must not be collected as a sample.
    (d) Fill the sample bottles from the discharge tubing taking care not to overfill the container and spill any preservative it may contain. Do not change the flow rate of the pump, it will affect the stabilization parameters and render a sample that is not representative. If VOA bottles are being filled they must be filled completely so that there is no airspace in the bottle. Sample containers should be filled in the following order: VOCs and natural attenuation parameters.
    (e) Samples should be placed on ice in a cooler immediately after they are collected.
    (f) Sample information is recorded on the CoC when they are placed in the cooler. All coolers shall contain a temperature blank if required by the analytical laboratory. A trip blank is required if the cooler contains VOC samples. Only one sample matrix (e.g., soil, groundwater) should occupy a cooler. The procedures for sample packing and shipping are outlined in Section 6.5.4 (Sample Preservation, Packing and Shipping). Custody procedures are outlined in Section 6.6.

(g) All equipment shall be decontaminated according to the methods described in the following section (Groundwater Sampling Equipment Decontamination). Upon completion of decontamination, all equipment should be disconnected and properly stowed.

(h) Dispose of used tubing, PPE, and plastic.

6.2.2 Groundwater Sampling Equipment Decontamination

All equipment that can potentially contaminate a groundwater sample must be decontaminated before it can be used. Equipment that may potentially contaminate a sample includes: pumps, water level indicators, and water quality meters. All groundwater sampling equipment should be washed and scrubbed in a detergent solution such as Alconox or Liquinox and water and rinsed with distilled water. The procedure for decontaminating groundwater sampling equipment varies greatly with the type of equipment in question. The specific procedures are outlined below.

The procedure for decontaminating a water level indicator is as follows:

1. Wearing a pair of nitrile gloves, layer several paper towels on top of one another. Apply detergent solution to one half of the face of the towels and distilled water to the other.
2. Fold the moistened towel around the tape of the water level indicator so that the portion saturated with distilled water is nearest to you.
3. Reel in the tape of the water quality meter.
4. When the tape has been completely reeled in scrub and rinse the probe.

The procedure for decontaminating a water quality meter is as follows:

1. Disconnect the flow through cell from the unit containing the probes.
2. Wash the flow through cell with detergent solution and rinse with distilled water.
3. Thoroughly rinse the probes with distilled water. The probes should be immersed in tap water for storage (Type II water should not be used as it is deficient in minerals).

The procedure for decontaminating a bladder pump is as follows:

1. Wearing a pair of nitrile gloves, disassemble the pump. Discard used inlet screens, grab plates, gaskets, and the PET bladder. If the bladder is made of Teflon, do not throw it away. Rinse it with distilled water and stow it in a resealable plastic bag for future sampling of the same well.
2. Wash and scrub individual parts with detergent solution, and rinse with distilled water. Allow the parts to dry.
3. Reassemble the pump with a fresh PET bladder or the Teflon bladder of the next well to be sampled. Store the pump in the supplied storage tube or wrap it in aluminum foil.

6.3 FIELD QUALITY CONTROL

6.3.1 Equipment Blank

An equipment blank is a sample of ASTM Type II reagent grade water poured into, over or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. Equipment blanks are used to assess the effectiveness of equipment decontamination procedures. The frequency of collection for equipment blanks is specified in Section 3.2. Equipment blanks shall be collected immediately after the equipment has been decontaminated. The blank shall be analyzed for all laboratory analyses requested for the environmental samples collected at the site.

6.3.2 Trip Blank

The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the sampling site, handled like an environmental sample and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank shall accompany each cooler of samples sent to the laboratory for analysis of VOCs.

6.3.3 Ambient Blank

The ambient blank consists of ASTM Type II reagent grade water poured into a VOC sample vial at the sampling site. It is handled like an environmental sample and transported to the laboratory for analysis. Ambient blanks are prepared only when VOC samples are taken and are analyzed only for VOCs. The frequency of collection for ambient blanks is specified in Section 3.2.

Ambient blanks are used to assess the potential introduction of contaminants from ambient sources (e.g., active runways, engine test cells, gasoline motors in operation, etc.) to the samples during sample collection. Ambient blanks shall be collected downwind of possible VOC sources. The frequency of collection for ambient blanks is specified in Section 3.2.

6.3.4 Field Duplicates

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis.

Duplicate sample results are used to assess precision of the sample collection process. Precision of soil samples to be analyzed for VOCs is assessed from collocated samples because the compositing process required to obtain uniform samples could result in loss of the compounds of interest. The frequency of collection for field duplicates is specified in Section 3.2.

6.4 SAMPLE HANDLING

All aspects of sample handling for this project are described below. Refer to Table 3.2-1 for a summary of the sample analysis to be performed.

6.4.1 Sample Containers

Sample containers are supplied by the analytical laboratory precleaned and treated according to USEPA specifications for the methods. Containers are stored in clean areas to prevent exposure to fuels, solvents, and other contaminants.

6.4.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the analytical methods performed on samples are listed in Table 6.5.2-1. Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Holding times are specified in Table 6.5.2-1. Samples not preserved or analyzed in accordance with these requirements shall be resampled and analyzed.

6.4.3 Sample Identification

All samples will be given a unique identifier. The date and time of sampling will be listed on the sample container. The date, time, and sample identifier will be recorded on the groundwater sample collection form for water samples, the borehole log for soil samples and in the logbook.

6.4.3.1 Soil Sample Identification

Soil samples will have a two-part identifier. The first component will be the site location identifier (03S or 06S). The second component of a soil sample identifier will consist of an S to indicate a soil sample and a two-digit number indicating the top or upper depth of the sample collected. No punctuation marks will be used for the sample numbers. Soil samples will be labeled in the form DP###Sdepth or SB###Sdepth for direct push points and soil borings respectively. A soil sample collected at the surface from direct push sampling point number 44 will be identified as DP044S00. A soil sample from soil boring MW401 at a depth of 22 feet below ground surface will be identified as SB401S22.

6.4.3.2 Groundwater Sample Identification

Water samples from monitoring wells will have a two-part identifier. The first component will be the site location identifier (e.g. 03MW or 06MW). The second portion of a groundwater sample identifier will consist of a MW to indicate that it is groundwater sample taken from a monitoring well, and the depth to the top of the screened interval.

Table 6.5.2-1
Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times

Name	Analytical Methods	Container[a]	Preservation[b]	Minimum Sample Volume or Weight	Maximum Holding Time
Volatile organics	SW8240B, SW8010B, SW8260A	G, Teflon®-lined septum, T, EnCore™ sampler	4^oC, 0.008% $Na_2S_2O_3$ (HCl to pH < 2 for volatile aromatics by SW8240 and SW8260)[b]	2 x 40 mL or 4 ounces 5 g (EnCore™)	14 days (water and soil); 7 days if unpreserved by acid, 24 hours for EnCore™
Semivolatile organics	SW8270B	G, Teflon®-lined cap, T	4^oC, 0.008% $Na_2S_2O_3$	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Metals	SW6010A SW6020 and SW-846 AA methods	P, G, T	HNO3 to pH < 2, 4oC	500 mL or 8 ounces	180 days (water and soil)

a. Polyethylene (P); glass (G); brass sleeves in the sample barrel, sometimes called California brass (T).
b. No pH adjustment for soil.

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The second portion of a groundwater sample identifier for a monitoring well will indicate the date on which the sample was collected. The date identifier will be in the form mmddyy and contain no punctuation. A groundwater sample collected from monitoring well 06MW21 on March 10, 2007 will be identified as 06MW2131005.

6.4.3.3 Quality Control Sample Identification

Field duplicates will be indicated by adding "D" to the end of the sample identifier. A matrix spike will be indicated by adding "MS" to the end of the sample identifier. Likewise, a matrix spike duplicate will be indicated by adding "MSD" to the end of the sample identifier. No punctuation marks will be used for the sample numbers.

QA/QC samples corresponding to the soil samples cited in the Soil Sample Identification section above will have the following formats:

- Field Duplicate: DP044S00D; SB401S22D
- Matrix Spike: DP044S00MS; SB401S22MS
- Matrix Spike Duplicate: DP044S00MSD; SB401S22MSD

QA/QC samples corresponding to the groundwater samples cited in the Groundwater Sample Identification section above will have the following formats:

- Field Duplicate: DP044W-36D; MW401031005D
- Matrix Spike: DP044W-36MS; MW401031005MS
- Matrix Spike Duplicate: DP044W-36MSD; MW401031005MSD

6.4.3.4 Equipment Blank Identification

Equipment blanks will have a two-part identifier. The letters EB will indicate that the sample is an equipment blank. The second part of the identifier indicates the sample date. The sampling date identifier consists of the sampling date in the form mmddyy. No punctuation marks will be used for the sample numbers. An equipment blank collected on October 17, 2007 will be identified as EB101707.

6.4.3.5 Trip Blank Identification

Trip blank identifiers will consist of three parts: the letters TB to indicate that the sample container is a trip blank; a date identifier; and a shipping container indicator. A trip blank must be included with any cooler containing samples intended for VOC analysis. The date identifier is the date in the form mmddyy. No punctuation marks will be used for the sample numbers. If more than one cooler is being sent for VOC analysis in a single day, the sampler will include their initials at the end of the trip blank identifier. For a cooler containing samples intended for VOC analysis that were sampled on December 19, 2007, the trip blank identifier will be TB121904. If two coolers were collected that day for VOC analysis, by John Doe and Mary Buck, the trip blank identifiers will be TB121907JD and TB121907MB

6.4.3.6 Ambient Blank Identification

Ambient blank identifiers will consist of two parts: the letters AB to indicate that the sample container is an ambient blank and a date indicator. The date indicator is in the form mmddyy. No punctuation marks will be used for the sample numbers. An ambient blank used during the course of sampling on April 20, 2007 will be identified as AB042007.

6.4.4 Sample Preservation, Packing, and Shipping

In order to ensure the integrity of samples transferred to the analytical laboratory all samples will be shipped in coolers. Coolers should only contain samples from one matrix; therefore, soil and groundwater samples will be shipped in separate coolers. Packing materials such as foam blocks (for VOA bottles) and bubble wrap should be utilized to minimize the potential for damage of samples during transit. All coolers will contain an adequate amount of ice to maintain samples at the temperature specified by the analytical laboratory. Temperature blanks will be placed in coolers to ensure samples are received at an appropriate temperature for analysis. Coolers containing samples intended for VOA will include a trip blank.

A chain of custody (CoC) form will be completed for each cooler as described in Section 6.6.1 (Field Custody Procedures). Earth Tech will retain a record of the completed CoC. The remaining copies will be placed in a watertight plastic bag and packaged inside the cooler. The cooler will then be secured with signed and dated custody seals and packing tape. At this time the samples shall be ready for delivery to the laboratory's courier or an approved shipping company (e.g., Fed Ex). If samples are to be shipped by Fed Ex they shall be insured at a value sufficient to cover the cost of re-sampling should they be lost or corrupted in transit.

6.5 SAMPLE CUSTODY

During field sampling activities, traceability of the samples must be maintained from the time that the samples are generated until laboratory data are issued. Information concerning collection of the samples will be recorded in the field notebook and sample log. Information on the custody, transfer, handling, and shipping of samples will be recorded on the CoC forms.

6.5.1 Field Custody Procedures

In order to ensure the integrity of samples in transit the following procedure shall be followed:

1. All samples should be clearly labeled according to the methods outlined in Section 6.5.3. The date and time of sampling should be recorded on the sample collection form or borehole log, the CoC, and in the logbook.
2. The number of containers for each sample being shipped in a cooler shall be recorded on the CoC.
3. The analyses requested for each sample shall be recorded on the CoC.
4. The project name, project manager, sampler name, and state of origin shall be recorded on the CoC.
5. The date and time of the transfer of custody shall be recorded on the CoC, as should the name of the Earth Tech employee relinquishing custody and the laboratory employee

assuming custody. In the event that the samples are shipped via Fed Ex, the name of the laboratory employee will be replaced by “Fed Ex.”

6. When the cooler has been packed in accordance with the methods described in Section 6.5.4 (Sample Preservation, Packing and Shipping), the CoC shall be placed in a water tight bag in the cooler and the cooler secured with signed, dated custody seals and packing tape.

6.5.2 Transfer of Custody and Shipment

Earth Tech personnel shall record the date and time at which they relinquished samples and their name on the CoC. The name of the laboratory representative assuming custody of the samples will also be recorded.

6.5.3 Laboratory Receipt and Entry of Samples

Earth Tech requires notification of receipt of samples from the analytical laboratory. If there are any discrepancies with the samples (e.g., analysis requests, sample temperature, etc.), Earth Tech shall be informed of them upon receipt of the samples by the laboratory.

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7.0 WASTE MANAGEMENT PLAN

7.1 WASTE MANAGEMENT PLAN PURPOSE AND OBJECTIVES

This Waste Management Plan was developed to ensure that investigation derived wastes (IDW) generated during the Field program at the SANGB are managed in accordance to the *ANG Investigation and Remediation Derived Waste Management Policy* dated March 2005.

SANGB operates under generator status pursuant to 40 CFR 262. As such this plan was developed to assure that IDW will be disposed of within 90 days of generation. The objectives of this plan are to provide the SANG an operation that includes sample consolidation, sample analysis, waste characterization/profiling, waste inventory control, waste minimization, and appropriate disposal of all wastes within 90 days of generation. Generation is defined as the date the material is containerized.

7.1.1 Schenectady ANG Waste Management Practices

Schenectady Air National Guard environmental management officials and other operational supervisors at SANG implement appropriate waste management practices. This is accomplished through close attention to the details of their waste management plans. A key component of the plan is to focus on timely disposal. Drums and other containers of waste are identified by markings and storage logs when on Base, and should be disposed of in the prescribed manner as soon as possible (i.e., within a 90 day period for hazardous waste, and at the completion of field sampling or sooner for all other). If questions regarding waste management are not addressed in this plan, they should be directed to the Base Environmental Manager.

7.1.2 Regulatory Considerations

The following State and Federal regulations and guidance documents were examined to identify applicable hazardous waste and/or special waste classification criteria, and other relevant waste characterization information.

- EPA/9345.3-03FS: USEPA, 1992, Guide to Management of Investigation-Derived Wastes.
- 40 CFR 262.11: Hazardous Waste Determination.
- 40 CFR 261.2: Identification and Listing of Hazardous Waste.
- 40 CFR 280.62(a)(4): Guidance for contaminated soil generated during an investigation.

7.1.3 IDW Management Plan Outline

IDW is generated as leftover material such as soil cuttings, well development water, purge water, decontamination fluids, and used personal protection equipment.

The following outlines the steps to be used in handling IDW at SANG:

1. Liquids (e.g., well development water, drilling fluids) and solids (soils) are separated at the generation point.
2. IDW is temporarily containerized for transport and labeled as to its type and origin. Containers will include:

- Fluid storage vessels,
- Roll-off bins,
- Drums, and
- Various other storage devices.

3. Containers are removed from the worksite at the completion of the day's activities. No IDW is stored at the worksite overnight.
4. Containers are transferred to a central storage area designated by SANG where IDW is placed in the appropriate bulk storage container. Temporary containers will be relabeled and reused for IDW storage.
5. Bulk containers will be sampled and tested as required by the disposal facility to determine disposal method.
6. If solid IDW is classified as hazardous it shall be disposed of within 90 days of generation.
7. Bulk liquid waste will be disposed of off-site by a subcontracted hauler/disposer according to applicable regulations.

7.2 GENERAL IDW MANAGEMENT PLAN

This waste management plan governs the disposal of all liquid and solid waste materials generated during the course of the proposed field activities of this program.

7.2.1 Types of Waste Anticipated

The proposed field activities of this program will generate both liquid and solid IDW. The wastes that will be encountered are:

- Drill cuttings from soil borings and monitor well installation,
- Well development water,
- Purge water,
- Decontamination water,
- Used personal protective equipment (PPE), and
- Free product.

7.3 WASTE MINIMIZATION

Waste minimization is a key component of the waste management plan. The following measures will be implemented to minimize waste generation.

7.3.1 Avoiding Unnecessary Contamination

The sampling areas will be secured, and only necessary equipment items will contact potentially contaminated media.

7.3.2 Reusable Materials

Reusable materials will be utilized whenever it is possible and appropriate. Examples of reusable materials include sampling equipment that can be decontaminated and used again, drums that can be emptied and decontaminated for future use, and reusable PPE.

7.3.3 Volume Reduction

Visible material will be scraped and brushed off of large equipment prior to decontamination. Hot spray washing will be used to minimize the quantity of water required.

7.4 HANDLING AND CONTAINERIZATION

All IDW will be placed into labeled containers and transported to the central staging area for bulk storage.

7.4.1 Waste Container Designation

Soil cuttings generated by the drilling and sampling of boreholes and monitoring wells will be placed into labeled drums or roll-offs for temporary storage and transport. Roll-offs will be located in the staging area while awaiting off-site disposal. Under no circumstances will soil cuttings be placed back into the soil boring or well, nor will they be spread around the area immediately surrounding the boring or well.

Water generated from the development and sampling of monitoring wells will be temporarily stored in either steel drums or a PET storage tank for temporary storage and transport to the bulk liquid storage container. Water will not be discharged onto the ground during drilling, development, or sampling.

Water generated from the decontamination of drilling equipment, sampling equipment, and personnel will be collected in labeled temporary storage containers for transport to the bulk storage area.

Used PPE generated during the filed activities will be collected in plastic garbage bags.

7.4.2 Labeling of Waste Containers

All containers being used for temporary storage and transport of IDW must have a label. The label should include the following information:

- A sequential or site specific container number;
- Location. This should include the site name and boring or well number;
- Date that the IDW was generated;
- Contents of container. If soil cuttings are being stored in the container the depth at which they were generated must be included;
- Geologist’s name; and
- Base contact and phone number.

7.4.3 Transporting Containers

Sealed, labeled containers will be transported to the temporary storage area on a daily basis. Containers will be emptied into the appropriate bulk storage unit and entered into a logbook.

7.5 TEMPORARY STORAGE LOCATIONS

SANG will designate a centralized storage area for IDW generated during field activities. The storage location must to be secure and properly managed. Relevant objectives for the centralized storage are as follows:

- Assure that SANGB waste management requirements are met;
- Avoid inclusion of other contractors' waste from previous activities at the Base;
- Ensure that SANGB and the contractor can accurately and easily identify wastes for disposal, sampling, and matching with test results;
- Preventing unauthorized handling or distribution of the waste, including removal for use by others;
- Bulk soils stored in the centralized storage area will be subject to the following additional requirements:
  - The location chosen for bulk soil storage must be conducive to storm water drainage; and
  - A water resistant cover must be affixed to the bulk roll-off bin. This cover should be constructed of a rigid material that allows rainwater to easily drain off of the bin and to the ground surface. If it is necessary to utilize a non-rigid material for the cover a support system must be developed that will eliminate sagging and puddle formation and allow for proper drainage.
- A daily inspection will be made of the temporary storage area to ensure that wastes are secure. A part of this inspection will be to check the bulk soil storage container for visible moisture. If liquid is visible in the roll-off box it will be solidified with fly ash or other inert material to prevent liquid build-up.

7.6 WASTE CHARACTERIZATION

Prior to disposal it must be demonstrated that the characteristics of the IDW meet chemical and physical requirements for the disposal selected. This waste characterization can be expedited through the proper management of the IDW in the field. SANG must keep records of any test results, waste analyses, or waste sent off-site for treatment, storage, or disposal. Earth Tech will collect waste samples and will be responsible for final disposal and will provide all necessary waste manifests to the Base Environmental Manager.

7.6.1 Drill Cuttings and Other Soils

Soils that have been determined to be "industrial" wastes will be containerized in the field and sent to the bulk temporary storage area where they will be dumped into the roll-off bin for off-site disposal. If liquid is visible in the drum of soil before deposition in the bulk container it should be decanted or otherwise transferred to a separate container for inclusion with the bulk liquid storage. It is important to avoid build-up of liquid in the bulk soil container (see Section 7.5 on Temporary Storage Locations).

Bulk soils will be sent to an approved waste handling facility for disposal. Prior to this disposal a representative sample will be collected by Earth Tech from the roll off and analyzed to ensure that the landfill criteria are met.

7.6.2 Well Development/Purge Water

Water generated by well development and sampling will be containerized and transported to the bulk storage area. It will then be either transported off-site for treatment/disposal by a subcontracted hauler/disposer after testing and characterization or treated on-site with the excavation dewatering treatment system.

7.6.3 Drilling and Decontamination Fluids

Water generated through drilling and decontamination will be treated of in the same manner as well development/purge water. Drilling and decontamination fluids will be bulked with other IDW water.

7.6.4 PPE

Used PPE will be bagged in plastic and disposed of in a domestic refuse receptacle.

7.6.5 Disposable Sampling Equipment and Decontamination Pad

These materials will be rinsed with clean water and disposed of with the bulk "industrial" waste soils.

7.7 IDW DISPOSAL

7.7.1 Non-hazardous IDW

The IDW generated during field activities is not expected to require management as hazardous waste. It is expected that the IDW will not contain a listed waste pursuant to 40 CFR 261, Subpart D, and will not exhibit characteristics (Ignitability, Corrosivity, Reactivity, Toxicity) of a hazardous waste pursuant to 40 CFR 261, Subpart C. All wastes will be bulked and disposed of as follows:

- Bulked soils will be tested for compliance as non-hazardous “industrial” wastes by the subcontracted hauler/disposer and disposed of off-site. Earth Tech will collect IDW samples. Analysis and disposal of the samples will be the responsibility of the ANG.
- Water in bulk storage will be treated on-site with the excavation dewatering treatment system.
- PPE will be disposed of off-site.

7.7.2 Manifesting and Record Keeping

The last component of the on-site management of the IDW is preparation for off-site disposal. This preparation is completed through the waste profile and waste manifest process.

All materials to be shipped off site must have a completed waste profile form. This includes bulk (non-hazardous) materials. Waste profile forms can be obtained from the transporter or receiving facility. In addition, all materials to be shipped off site will be accompanied by a waste manifest. These manifest forms can be obtained from the transporter or receiving facility and will be used for bulked materials.

All waste manifests must be completed and submitted to the Environmental Management Office, along with the appropriate analysis, at least 72 hours prior to disposal. Unless otherwise determined by SANG, Lt. Col. Ron Leadley will be the signature on the waste manifest. The waste manifests must be obtained from the consignment (receiving) state, or the generator (source) state.

SANG (the generator) must have a sufficient number of copies of the manifest for the generator, each transporter, the owner or operator of the designated treatment, storage, or disposal facility, and a copy to be returned to the generator by the designated facility. The manifest must be signed by hand by one of the above persons and the transporter's representative upon delivery to the transporter. SANG retains one copy; the rest of the copies are given to the transporter. SANG will also keep the returned copy from the designated facility for its files and is required to keep them for three years.

Within 45 days of shipment, SANG must receive a copy of the signed manifest from the designated facility. To ensure that this 45-day deadline is met, SANG is to notify the contractor if they have not received a copy of the signed manifest from the owner or operator of the designated facility within 35 days of delivery to the initial transporter. The contractor must then contact the transporter and/or the designated facility and attempt to locate the manifest. If the signed manifest cannot be located or SANG does not receive the signed manifest copy within 45 days an exception report will be filed with the USEPA. The report must include the following:

- A legible copy of the manifest for which the confirmation of delivery is missing; and
- A cover letter signed by one of the above SANG representatives explaining efforts to locate the hazardous waste and the results of those efforts.

This exception report must be maintained for three years.

8.0 PROJECT DOCUMENTATION

8.1 PROJECT LOGBOOK

Field data collection activities will be documented in a logbook as described in the QAPP. Entries will be described at a level of detail such that situations can be reconstructed by all parties without the aid of memory. All logbooks will be kept in the project files. Project files will be turned over to the client if requested at the completion of the project contract.

A variety of activities will be recorded in the logbook. The information to be documented shall include:

- Project identification;
- Field activity subject;
- General work activity;
- Personnel on site identified by company or affiliation;
- Weather conditions;
- Time and topics of tailgate safety meetings;
- Unusual events;
- Visitors on site;
- Subcontractor progress or problems;
- Communication with the co-workers, laboratory, client or others;
- All sample numbers, collection times, sample amount, analysis, CoC numbers;
- Accomplishment of decontamination of drilling and sampling equipment;
- Accomplishment of required calibration and calibration checks;
- Disposition of decontamination fluids;
- Variances from project plans and procedures;
- Photographs taken and identification numbers; and
- Air monitoring readings, as appropriate.

8.2 FIELD FORMS

A variety of forms will be used to document field activities. Forms to be used on this project are:

- Equipment calibration forms,
- Borehole drilling logs,
- Well construction diagrams,
- Decon records,
- Groundwater level forms,
- Monitor well development forms,
- Monitor well sample collection forms, and
- Chain-of-Custody forms.

Each completed form (a copy of original depending on the type of form) will be kept on site in chronological order with other completed forms of the same type until the field activity is completed. Copies of completed forms will be sent to the Project Manager. Upon completion of the field investigation, all original field records will be transferred to the project files. Working copies of all forms will be retained by project personnel for data evaluation and report preparation as necessary.

8.3 PHOTOGRAPHS

All photographs will include documentation of the date and time at which they were taken as well as a brief description of the subject matter. This information will be recorded in the field notebook.

8.4 ELECTRONIC DATA MANAGEMENT

Data collected during field activities will require electronic data submission in the form of Environmental Resources Program Information Management System (ERPIMS) deliverables. Laboratory data will be reported to Earth Tech within 4 weeks of receipt of samples by the laboratory, depending on the sample matrix.

Earth Tech will implement data management procedures to meet the deliverable requirements of ERPIMS. Data will be managed using database software. Field and laboratory data will be reported to meet ERPIMS format deliverable requirements. Earth Tech will assess the accuracy and completeness of all data submitted. All data entered into the data files and submitted by Earth Tech shall correspond with the data contained in the original laboratory reports and other documents associated with the contracted sampling and laboratory analysis tasks.

9.0 REFERENCES

U.S. Environmental Protection Agency (USEPA). 1996. Standard Operating Procedure No. 2042. Soil Gas Sampling. USEPA Environmental Response Team, Edison, New Jersey. http://epa.gov/neerqa/qa/qa_docs.html.

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APPENDIX C
Quality Assurance Project Plan

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FINAL
QUALITY ASSURANCE PROJECT PLAN

New York Air National Guard
Schenectady Air National Guard Base
1 Air National Guard Road
Scotia, New York 12302

Prepared for:

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3500 Fetchet Avenue
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April 2007

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LIST OF ABBREVIATIONS AND ACRONYMS

ANG	Air National Guard
ASTM	American Society for Testing and Materials
BS	Blank Spike
BSD	Blank Spike Duplicate
CoC	Chain-of-Custody
DAF	Diffusion Attenuation Factor
DOT	Department of Transportation
DQO	Data Quality Objective
DVR	Data Validation Report
ECD	Electron Capture Detector
FID	Flame Ionization Detector
FFS	Focused Feasibility Study
FSP	Field Sampling Plan
GC	Gas Chromatograph
GC/MS	Gas Chromatograph/mass spectrometer
GFAA	Graphite Furnace Atomic Absorption
GRO	Gasoline Range Organics
ICAL	Initial Calibration
ICP	Inductively coupled plasma emission spectroscopy
ICS	Interference Check Sample
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
IRA	Interim Removal Action
IS	Internal Standard
L	liter
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MCL	Maximum Contaminant Level
mL	milliliter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Available
NCR	Nonconformance Report
NIST	National Institute of Standards and Technology
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PE	Performance Evaluation
QA	Quality Assurance
QAPP	Quality Assurance Project Plan

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

QC	Quality Control
QCSR	Quality Control Summary Report
RBC	Risk-based Concentration
RCRA	Resource Conservation and Recovery Act
RF	Response Factor
RI/FS	Remediation Investigation/Feasibility Study
RL	Reporting Limit
RPD	Relative Percent Difference
RRF	Relative Response Factor
RSD	Relative Standard Deviation
RT	Retention Time
SIM	Selective Ion Monitoring
SSL	Soil Screening Level
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
TPH	Total Petroleum Hydrocarbon
TIC	Tentatively Identified Compound
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
°C	Degrees Celsius
$NaHSO_4$	Sodium Bisulfate
HCL	Hydrochloric Acid
H_2SO_4	Sulfuric Acid
≤	Less than or equal to
≥	Greater than or equal to
±	Plus or minus
%R	Percent Recovery

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared by Earth Tech Northeast, Inc., according to the United States Environmental Protection Agency's (USEPA) guidance and requirements for preparing QAPPs (USEPA, 2000, USEPA, 2001) and the New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP, July 2005) for use in conjunction with the Interim Remedial Actions (IRAs) and a Focused Feasibility Study (FFS) at Schenectady Air National Guard (ANG) Base (Base) located at 1 Air National Guard Road, Scotia, Schenectady County, New York. This work is being performed under Contract Number DAHA92-02-D-0012, delivery order 0062.

This QAPP contains quality assurance/quality control (QA/QC) procedures necessary to ensure that analytical data collected in support of the Interim Removal Action/Focused Feasibility Study (IRA/FFS) are planned and executed in a manner consistent with the projects' quality assurance objectives. The objective of the QAPP is to ensure the technical data generated during the IRA/FFS are of sufficient quality for making informed decisions regarding Base groundwater and soil quality. The IRA/FFS work plan (WP) and IRA/FFS field sampling plan (FSP) are companion documents to this QAPP.

1.1 PROJECT BACKGROUND

Section 1 of the work plan provides a discussion of the project background.

1.1.1 Site History and Contaminants

Section 2 of the field sampling plan provides a discussion of the site history and contaminants.

1.1.2 Summary of Existing Site Data

Section 3 of the work plan summarizes the existing site data.

1.1.3 Project Scope and Objectives

Section 1 of the work plan provides a detailed discussion of the project scope and objectives, which are summarized below.

The overall project objectives for the IRA/FFS are:

- To conduct IRAs at Sites 3 and 6 to remove and dispose off-site contaminated soil and buried waste;
- To develop a FFS to vertically delineate groundwater contamination, perform an enhanced bioremediation pilot study, assess human health and ecological risks, and evaluate remedial alternatives for any residual contamination at Sites 3 and 6.

Groundwater and soil samples will be collected and analyzed by the methods specified in FSP Table 3.2-1.

1.2 OVERVIEW OF QAPP

The body of this QAPP is required reading for all project personnel, including field and laboratory personnel, and is organized as follows:

Section 1.0	Introduction
Section 2.0	Analytical Laboratory/Analytical Methods
Section 3.0	Data Quality Objectives
Section 4.0	Project Organization, Responsibilities, and Schedule
Section 5.0	Documents and Records
Section 6.0	Sample Handling, Labeling, Shipping, and Custody Requirements
Section 7.0	Quality Assurance /Quality Control
Section 8.0	Equipment Calibration and Maintenance
Section 9.0	Assessment and Oversight
Section 10.0	Data Verification, Review, and Validation
Section 11.0	References.

Appendix B of the work plan contains the FSP and is required reading for all field personnel.

2.0 ANALYTICAL LABORATORY/ANALYTICAL METHODS

The analytical laboratory contracted to perform the sample analyses will be a New York State Department of Health (NYSDOH), Environmental Laboratory Approval Program (ELAP) certified laboratory with the Contract Laboratory Protocol (CLP) certification. The QAPP for the selected laboratory will be included as Attachment C to this document.

All samples will be analyzed following the NYSDEC, Analytical Services Protocol (ASP, July 2005) CLP procedures with complete CLP deliverables. Required samples and methods are presented in Table 6-1.

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3.0 DATA QUALITY OBJECTIVES

Data quality objectives (DQO) for data measurement are generally defined in terms of six parameters: precision, accuracy, representativeness, comparability and completeness (PARCC). The following DQO's have been established to ensure the data collected as part of this program are sufficient and of adequate quality for their intended uses. Data collected and analyzed in conformance with the DQO process described in this QAPP are used to assess the uncertainty associated with decisions related to the Base. The basis for assessing each of these elements of data quality is discussed in the following subsections.

3.1 PRECISION

Precision measures the reproducibility of measurements. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. *Analytical* precision is the measurement of the variability associated with duplicate (two) or replicate (more than two) analyses. The blank spike (BS) or laboratory control sample (LCS) may be used to determine the precision of the analytical method. If the recoveries of analytes in the BS or LCS are within established control limits, then precision is within limits. In this case, the comparison is not between a sample and a duplicate sample analyzed in the same batch, rather the comparison is between the sample and samples analyzed in previous batches. *Total* precision is the measurement of the variability associated with the entire sampling and analysis process. It is determined by analysis of duplicate or replicate field samples and measures variability introduced by both the laboratory and field operations. Field duplicate samples and MSD samples shall be analyzed to assess field and analytical precision. Precision is determined using the relative percent difference (RPD) between the duplicate sample results. The formula for the calculation of precision is provided in Table 3-1 as RPD. For replicate analyses, the relative standard deviation (RSD) is determined. The formula for the calculation of RSD is provided in Table 3-1.

3.2 ACCURACY

Accuracy is a statistical measurement of correctness and includes components of random error (variability due to imprecision) and systemic error. It therefore reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ from the true value or known concentration of the spike or standard. Accuracy is measured by comparing the percent recovery of analytes spiked into a BS, LCS, MS, or MSD to a control limit. For organic compounds, surrogate compound recoveries are also used to assess accuracy and method performance for each sample analyzed. Analysis of performance evaluation (PE) samples may also be used to provide additional information for assessing the accuracy of the analytical data being produced.

The formula for calculation of accuracy is included in Table 3-1 as percent recovery (%R) from pure and sample matrices. .

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Table 3-1
Statistical Calculations

Statistic	Symbol	Formula	Definition	Uses
Mean	$\overline{X}$	$\dfrac{\left(\sum_{i=1}^{n} x_i\right)}{n}$	Measure of central tendency	Used to determine average value of measurements
Standard Deviation	S	$\left(\dfrac{\Sigma(x_i-\overline{X})^2}{(n-1)}\right)^{½}$	Measure of relative scatter of the data	Used in calculating variation of measurements
Relative Standard Deviation	RSD	$(S/\overline{X})$ x 100	Relative standard deviation, adjusts for magnitude of observations	Used to assess precision for replicate results
Percent Difference	%D	$\dfrac{x_1 - x_2}{x_1}$ x 100	Measure of the difference of 2 observations	Used to assess accuracy
Relative Percent Difference	%RPD	$\left(\dfrac{(X_1 - X_2)}{(X_1 + X_2)/2}\right)$ x 100	Measure of variability that adjusts for the magnitude of observations	Used to assess total and analytical precision of duplicate measurements
Percent Recovery	%R	$\left(\dfrac{X_{meas}}{X_{true}}\right)$ x 100	Recovery of spiked compound in clean matrix	Used to assess accuracy
Percent Recovery	%R	$\dfrac{\left(\text{value of spiked sample} - \text{value of unspiked sample}\right)}{\text{Value of added spike}}$ x	Recovery of spiked compound in sample matrix	Used to assess matrix effects and total precision

x = Observation (concentration)
n = Number of observations

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3.3 REPRESENTATIVENESS

Objectives for representativeness are defined for each sampling and analysis task and are a function of DQOs. Representativeness shall be achieved through use of standard field, sampling, and analytical procedures. Representativeness is also determined by appropriate program design, with consideration of elements such as proper well locations, drilling and installation procedures, and sampling locations. Decisions regarding sample/well/ boring locations and numbers and the statistical sampling design are documented in the work plan Section 3.0.

3.4 COMPLETENESS

Completeness is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples (e.g. by site). Completeness is calculated and reported for each method, matrix and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with an "R" flag (see Attachment A for an explanation of flagging criteria). The requirement for completeness is 90 percent. For any instances of samples that could not be analyzed for any reason (holding time violations in which resampling and analysis were not possible, samples spilled or broken, etc.), the numerator of this calculation becomes the number of possible results minus the number of possible results not reported.

The formula for calculation of completeness is presented below:

$$\%\ \text{completeness} = \frac{\text{number of valid (i.e., non-R flagged) results}}{\text{number of possible results}}$$

3.5 COMPARABILITY

Comparability is the confidence with which one data set can be compared to another data set. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions and using standard and comprehensive reporting formats. Complete field documentation using standardized data collection forms shall support the assessment of comparability. Analysis of PE samples and reports from audits shall also be used to provide additional information for assessing the comparability of analytical data produced among laboratories. Historical comparability shall be achieved through consistent use of methods and documentation procedures throughout the project.

3.6 REPORTING LIMITS

The estimated reporting limits or practical quantification limits desired for each analysis are the Contract Required Detection Limits specified in the NYSDEC ASP (July 2005). All such limits are dependent upon matrix interferences and reporting limits may vary as a result of dilution.

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4.0 PROJECT ORGANIZATION, RESPONSIBILITIES, AND SCHEDULE

Project organization, responsibilities, and schedule are presented in Section 4.0 of the FSP (Appendix B of the work plan).

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5.0 DOCUMENTS AND RECORDS

The following sections describe the types of documents and records that will be produced for this project.

5.1 QUALITY ASSURANCE PROJECT PLAN

Earth Tech's project manager shall be responsible for ensuring all project team members, including subcontractors, have the most current version of this QAPP, by using the distribution list at the beginning of this QAPP. Each project team member identified on the distribution shall be required to sign a controlled distribution list to show that have received the recent version of the QAPP. Upon receipt of the most recent revision of this QAPP, the former version will be returned to the project manager for disposal.

5.2 INFORMATION AND RECORDS TO BE INCLUDED IN THE DATA REPORT PACKAGE

Section 6.0 of the work plan provides information and records to be included in the data report packages.

5.3 PROJECT REPORTS

Section 8.0 of the work plan describes project reports.

5.4 CORRECTION TO DOCUMENTATION

If an error (e.g., incorrect date or sample depth) is made on a document, corrections will be made by crossing through the error with a single line so that the original entry can still be read and entering the correct information. All corrections will be initialed and dated.

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6.0 SAMPLE HANDLING, LABELING, SHIPPING, AND CUSTODY REQUIREMENTS

6.1 SAMPLE CONTAINERS

Sample containers shall be purchased pre-cleaned and treated according to USEPA specifications for the methods. Containers shall be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. Amber glass bottles shall used routinely where glass containers are specified in the sampling protocol.

6.2 SAMPLE VOLUMES, CONTAINER TYPES, AND PRESERVATION REQUIREMENTS

All sample containers used will be of traceable quality purchased and supplied by the laboratory. The selection of sample containers used to collect the samples is based on the following considerations:

- sample matrix;
- analytical methods;
- potential contaminants of concern;
- reactivity of container material with sample; and
- QA/QC requirements.

All samples will be collected and preserved, and all analytical holding times will conform to either the NYSDEC Analytical Services Protocols (July, 2005) or those required by the approved ELAP laboratory conducting the analyses. Sample volumes, container types, and preservation requirements by analytical method are listed in Table 5-1.

6.3 SAMPLE LABELING AND NUMBERING

All samples, including field QC samples, must be labeled and assigned a unique number.

6.3.1 Sample Labeling

Sample labels are required for properly identifying samples and evidence. All samples (i.e., each sample container) must be properly labeled with the label affixed to the container prior to transportation to analytical or geotechnical laboratories. Information on the sample label should include, but not limited to, the following:

- Project Code: Earth Tech, project number, and site name.
- Station Number: A unique identifier assigned to a sampling point by the sampling team.
- Sample Identification Number: See FSP Section 6.5.3.
- Samplers: Each sampler’s name or initials and signature.
- Preservative: Whether a preservative is used and the type of preservative.
- Analysis: The type of analysis requested.
- Date/Time: The date and time the sample was collected.
- Type of Sample: The type of sample should be identified as discrete or composite.

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Table 6-1
Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times

Name	Analytical Methods	Containers	Preservation	Maximum Holding Time
Analytical Services Protocol (ASP) Requirements				
Volatile Organic Compounds (VOCs) and gasoline range organics (GRO)	8260B, 8015	***Aqueous***: 2 x 40 mL glass VOC vial, PTFE septa cap ***Solid***: 3 5-g EnCore™ samplers or add 5-g each to 3 x 40 (or 60) mL glass VOC vial (with stir bar and 1-g $NaHSO_4$ and 5 mL water for low level samples or 10 mL methanol for high level samples), PTFE septa cap	***Aqueous***: If no residual chlorine present, HCl, H_2SO_4, or $NaHSO_4$ to pH < 2, or solid $NaHSO_4$. Cool to 4°C. If residual chlorine present, add sodium thiosulfate and then preserve with HCl, H_2SO_4, or $NaHSO_4$ to pH < 2, or solid $NaHSO_4$. Cool to 4°C. ***Solid***: See Container instructions, cool to 4°C, Freeze samples collected in EnCore™ samplers to -10°C if unable to preserve with $NaHSO_4$ within 48 hours.	***Aqueous***: 14 days (7 days if not preserved with HCl or $NaHSO_4$) ***Solid***: If collected in Encore sampler 48 hours to $NaHSO_4$ preservation or frozen to -10°C. Otherwise, 14 days
Extractable Organics (SVOCs, PCBs, PAHs, lubricant oil)	8270C, 8082, 8015, 8270C with SIM	***Aqueous***: 2 x 1L amber glass bottles with Teflon-lined cap(s) ***Solid***: 250 mL wide-mouth glass jars with Teflon lined lids.	***Aqueous***: If no residual chlorine present, cool to 4°C. If residual chlorine present, add 1 mL sodium thiosulfate per liter of water, cool to 4°C. ***Solid***: Cool to 4°C.	***Aqueous***: 7 days until extraction and 40 days after extraction ***Solid***: 14 days until extraction and 40 days after extraction
Metals (except mercury) Total Hardness	6010B SW-846 7000 methods	***Aqueous***: 500 mL high density polyethylene bottles. ***Solid***: 250 mL wide-mouth glass jars with Teflon lids.	***Aqueous***: HNO_3 to pH <2 ***Solid***: Cool to 4°C.	***Aqueous and Solid***: 6 months
Mercury	7470A 7471A	***Aqueous***: 500 mL high density polyethylene bottles or glass. ***Solid***: 250 mL wide-mouth glass jars with Teflon lids.	***Aqueous and Solid***: Cool to 4°C.	***Aqueous and Solid***: 28 days
Additional Requirements (Chemtech)				
Nitrate (NO_3) /Nitrite (NO_2)	353.2	***Aqueous***: 1 L high density polyethylene bottle	***Aqueous*** Cool to 4°C	***Aqueous***: 48 Hours
Dissolved Oxygen	360.2	***Aqueous***: 300 mL glass bottle with glass stopper	***Aqueous***: Cool to 4°C.	***Aqueous***: 8 hours or as soon as possible
pH	150.1	***Aqueous***: 1 L high density polyethylene bottle.	***Aqueous***: Cool to 4°C.	***Aqueous***: As soon as possible
Redox Potential	1498	***Aqueous***: 1 L high density polyethylene bottle.	***Aqueous***: Cool to 4°C.	***Aqueous***: 24 Hours
Turbidity	180.1	***Aqueous***: 1 L high density polyethylene bottle.	***Aqueous***: Cool to 4°C.	***Aqueous***: 48 Hours
Nitrogen Organic, Total Phosphorus	351.2, 365.2	***Aqueous***: 1 L high density polyethylene bottle.	***Aqueous***: H_2SO_4, cool to 4°C.	***Aqueous***: 28 Days
Total Kjeldahl Nitrogen (TKN), Total Organic Carbon (TOC)	351.3, 415.1	***Aqueous***: 1 L high density polyethylene bottle.	***Aqueous***: H_2SO_4, cool to 4°C.	***Aqueous***: 28 Days

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6.3.2 Sample Numbering

A sample numbering system is used to uniquely identify each sample (including field QC samples) collected and submitted for analysis. The purpose of the numbering system is to assist in the tracking of samples and facilitate retrieval of analytical results. Sample identification numbers should be used on sample labels, chain-of-custody (CoC) forms, field logbooks, and all other applicable documentation. A listing of all sample identification numbers should be recorded in the field logbook.

Section 6.5.3 of the FSP describes how sample identification numbers will be assigned.

6.4 SAMPLE CHAIN-OF-CUSTODY PROCEDURES

CoC procedures provide documentation of the custody and integrity of the samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in field and laboratory records. Records concerning the cleaning of empty sample containers, container shipment from the laboratory to the site, and security of empty containers at the site should also be maintained.

The CoC record serves as a legal record and shall be maintained for all field and field QC samples. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession, (2) it is in their view, after being in their possession, (3) it was in their possession and they locked it up or, (4) it is in a designated secure area.

The following information concerning the sample shall be documented on the CoC form:

- Unique sample identification
- Date and time of sample collection
- Source of sample (including name, location, and sample type)
- Designation of matrix spike/matrix spike duplicate (MS/MSD)
- Preservative used
- Analyses required
- Name of collector(s)
- Pertinent field data (pH, temperature, etc.)
- Serial numbers of custody seals and transportation cases (if used)
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratory or laboratories
- Bill of lading or transporter tracking number (if applicable)

In addition to the CoC record, there is also a CoC (custody) seal. The CoC seal is an adhesive seal placed in areas such that if a sealed container or cooler is opened, the seal would be broken. The CoC seal ensures that no sample tampering occurred during shipment of samples from the field to the laboratories. Sample custody procedures are also discussed in 6.5 of the FSP.

6.4.1 Transfer of Custody and Shipment

All sample shipments and transfers, including shipment or transfer between laboratories, must be accompanied by the CoC record. The CoC record must be signed and dated (with time) by the person (i.e., sampler, sample manager, etc.) relinquishing custody of the samples and the person receiving the samples at the laboratory. A copy of the CoC record should be retained in the field records and the laboratory records. Transfer of custody and shipment are also discussed in 6.6 of the FSP.

6.5 SAMPLING HANDLING AND SHIPPING

Samples collected in the field shall be transported to the laboratory or field testing site as expeditiously as possible. When a 4°C requirement for preserving the sample is indicated, the samples shall be packed in ice to keep them cool during collection and transportation. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. A temperature blank (a volatile organics compounds sampling vial filled with tap water) shall be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory. The laboratory also may use a temperature infrared gun to determine the temperature of individual samples and the cooler. If the temperature of the samples upon receipt exceeds the temperature requirements, the exceedance shall be documented in laboratory records and discussed with the client. The decision regarding the potentially affected samples shall also be documented.

The original CoC record and one copy shall be placed in a plastic bag and secured to the inside lid of the shipping container (i.e., cooler). A copy of the CoC record shall be retained in the field. The original CoC record shall be transmitted to the project chemist after samples are accepted at the laboratories. This copy shall become part of the project file.

Shipping containers (i.e., coolers) must be secured with strapping tape and custody seals. The custody seals must be placed on the container so that it cannot be opened without breaking the seals. The seal must be signed and dated by the field investigator.

If samples are sent by mail, the containers shall be registered with return receipt requested. If sent by common carrier, an air bill shall be used. Receipts from post offices and air bills shall be retained as part of the CoC documentation. Air bill numbers or registered mail serial numbers shall be recorded in the remarks section of the CoC record.

Sample shipments including methanol preserved samples, hazardous waste samples, radioactive samples, etc. may have special handling and shipping requirements. Check local, state and department of transportation (DOT) regulations and with the carrier regarding shipping of these types of samples. The handling and shipping of samples is also discussed in 6.5 of the FSP.

6.6 SAMPLE RECEIPT

For the safety of the personnel involved, coolers shall be opened in a hood in case there has been any breakage of containers of potentially contaminated sample material. The laboratory shall check the sample shipment for evidence of tampering and be check sample label information and quantities against information on the CoC form for anomalies. The condition, temperature, and appropriate preservation of samples shall be checked and documented on the CoC form. Checking an aliquot of the sample using pH paper is an acceptable procedure except for VOCs where an additional sample is required to check preservation. All sample information shall then be entered into a tracking system, and unique analytical sample identifiers shall be assigned. A copy of this information shall be reviewed by the laboratory project manager for accuracy. Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Holding times are specified in Table 5-1.

The laboratory shall report occurrences of any anomalies in the received samples to Earth Tech's project chemist as soon as possible and no later than one working day. The laboratory shall document the resolution of the anomaly in their laboratory records.

Subcontracted analyses shall be documented on the CoC form. Procedures ensuring internal laboratory CoC shall also be implemented and documented by the laboratory. Specific instructions concerning the analysis specified for each sample shall be communicated to the analysts. Analytical batches shall be created, and laboratory QC samples shall be introduced into each batch.

While in the laboratory, samples shall be stored in limited-access, temperature-controlled areas. Refrigerators, coolers and freezers shall be monitored for temperature. Acceptance criterion for the temperatures of the refrigerators and coolers is 4°C± 2°C. Acceptance criterion for the temperatures of the freezers shall be less than 0°C. All of the cold storage areas shall be monitored by thermometers that have been calibrated with a National Institute of Standards and Technology (NIST)-traceable thermometer. As indicated by the findings of the calibration, correction factors shall be applied to each thermometer. Records that include acceptance criteria shall be maintained. Samples for volatile organics determination shall be stored separately from other samples, standards, and sample extracts. Samples shall be stored after analysis until disposed of per applicable local, state, and federal regulations. Disposal records shall be maintained by the laboratory. Refrigerators storing volatile organic compound (VOC) samples shall contain a blank that shall be analyzed on a regular schedule.

Standard operating procedures (SOPs) describing sample control and custody shall be maintained by the analytical laboratories.

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7.0 QUALITY ASSURANCE /QUALITY CONTROL

The two general categories of data are defined as: (1) screening data and (2) definitive data.

Screening data are generated by rapid methods of analysis with less rigorous sample preparation, calibration and/or QC requirements than are necessary to produce definitive data. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data may provide analyte identification and quantitation, although the quantitation may be relatively imprecise. Physical test methods, e.g., dissolved oxygen measurements, temperature and pH measurements, moisture content, turbidity, conductance, etc., have been designated by definition as screening methods.

Definitive data are generated using rigorous analytical methods, such as approved USEPA reference methods. The data can be generated in a mobile or off-site laboratory. Data are analyte-specific, and both identification and quantitation are confirmed. These methods have standardized QC and documentation requirements. Definitive data are not restricted in their use unless quality problems require data qualification.

7.1 FIELD AUDITS

The Project Manager and Project QA/QC Officer are responsible for ensuring all field investigations are performed in accordance with the requirements and specifications outlined in this QAPP. The QAO is responsible for providing QA/QC supervision and guidance relative to all work performed by Earth Tech employees and subcontractors assigned to the project.

As part of Earth Tech's field QA/QC program, a field audit is performed by Earth Tech's QAO or a designated representative on projects where sampling activities extend for more than one week. The primary purpose of the field audit is to monitor project sampling practices. The QA/QC field audit is performed during sampling to evaluate the performance of work during the collection of samples for laboratory analysis.

For projects of short duration (i.e., continuous field work of less than one week), a formal audit of field activities is not performed. The field team leader or appropriate task manager monitor field performance and document all work performed in field notes, a narrative, and a checklist of tasks. The Project Manager and/or Project QA/QC Officer review this documentation to ensure the necessary information has been recorded and conducts discussions with field team members to verify field activities were performed according to the project Work Plan, QAPP and HASP. The QAO communicates concerns, if any, to the field team as appropriate. A field audit will be performed in conjunction with this project.

7.2 MEETINGS

Periodic meetings between the Project Manager and QAO will be held to review quality assurance procedures, field work, laboratory performance and data documentation and review. Any potential problems identified during the review are documented and addressed. If necessary, they are reported to management for review and appropriate corrective action.

7.3 FIELD AND LABORATORY QUALITY CONTROL SAMPLES

The scope and application of this instruction is to describe the standard QC samples that shall be included in the project data collection program to support the DQOs. The QC samples described include field QC and laboratory QC samples used to assess sources of error at each stage of the sampling and analytical process. The entire sequence of sample collection, preservation, storage, and shipment has unique errors associated with it, as do the events that occur in the analytical laboratory. To assess the impact these errors have on the resulting data, a combination of unique field and laboratory QC samples shall be incorporated into the data collection program.

7.3.1 Field Quality Control Samples

Principle elements of sampling and field QA/QC strategy include developing a sound sampling approach based upon the intended use of the data; using sampling methodologies that allow the collection of representative samples based upon data needs; using sampling devices that minimize the disturbance or alteration to the chemical composition of the media; employing decontamination procedures that reduce cross-contamination potential between sampling points; and using proper sample containers and preservation techniques that maximize the integrity of the samples. The applicability and appropriateness of the field sampling protocol shall be verified by the inclusion the field QC samples listed in Table 7-1.

All field QC samples shall be handled exactly as the environmental samples. With the exception of the MS/MSDs and trip blanks, the identity of the field QC samples shall be blind to the laboratories. Each field QC sample shall be assigned a unique sample number as described in FSP Section 6.5.3.

7.3.1.1 Field Duplicate Samples

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method. Field duplicate samples are defined as a second sample collected from the same location, at the same time, in the exact same manner as the first and placed into a separate container (with no prior mixing). Field duplicate samples are collected at a frequency of one per every twenty (20) samples per matrix. Each duplicate sample is analyzed for the same parameters as the samples collected that day. Thus, both field and laboratory variability are evaluated. Acceptance and control limits for the laboratory follow NYSDEC ASP guidelines for organic analyses. However, any deviations in the data with respect to the limits will be discussed in the report. Although there are no established QC limits for field duplicate RPD data, Earth Tech considers RPD values of 40% or less an indication of acceptable sampling and analytical precision.

7.3.1.2 Split Samples

Split samples are usually used for performance audits or inter-laboratory comparability of data. The collection of split samples is not anticipated during the course of this project. However, if the NYSDEC (or other appropriate agency) requests split samples to be collected, then the following applies. A split sample is defined as two separate samples taken from a single aliquot that has been thoroughly mixed or homogenized prior to the formation of the two separate samples.

Table 7-1
Field Quality Control Samples

Field QC Sample	Description	Frequency of Collection	Evaluation Criteria
Field Duplicate	A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples shall be collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis.	10% of environmental samples per matrix per method	***Water***: RPD $\leq$ 35% ***Soil and Waste***: RPD $\leq$ 50%
Matrix Spike/ Matrix Spike Duplicate	A MS and MSD are aliquots of sample spiked with known concentrations of all target analytes listed for each method in Attachment A. Spiking shall occur prior to sample preparation and analysis. Each analyte in the MS and MSD shall be spiked at a level less than or equal to the midpoint of the calibration curve for each analyte. Only project samples shall be used for spiking. The MS/MSD shall be designated on the chain of custody.	5% of environmental samples per matrix per method	See evaluation criteria for specific analytes in Attachment A
Trip Blank	VOC sample vials filled with ASTM Type II water or equivalent at the analytical laboratory, shipped with empty VOC sample containers to the sampling site, and shipped back to the laboratory with samples for VOC analysis. Trip blanks shall not be opened in field. Trip blanks shall be analyzed for the same analytes as the VOC samples. Trip blanks are used to assess any potential introduction of cross contamination from sample containers or during the storage or transportation process.	Each cooler containing samples for VOC analysis per method.	Target analytes < method detection limit, with the exception of acetone, toluene, 2-butanone, and methylene chloride.
Ambient Blank	VOC vials filled with ASTM Type II water or equivalent during groundwater and/or surface water sampling events. Ambient blanks will be collected for VOC analysis only. Ambient blanks are used to assess any possible cross contamination due to the ambient environment.	One per event or weekly, which ever is more frequent, per method.	Target analytes < method detection limit, with the exception of acetone, toluene, 2-butanone, and methylene chloride.
Equipment Blank	Made by pouring ASTM Type II water or equivalent on non-dedicated or non-disposable field sampling equipment. The equipment blank shall be collected after the field sampling equipment is decontaminated. Equipment blanks shall not be collected from backhoe buckets, shovels, or sample containers. The EB shall be analyzed for the same methods as the environmental samples. The EB is used to assess the effectiveness of the equipment decontamination procedure.	Daily per equipment type, decontamination event, and method	Target analytes < method detection limit, with the exception of phthalate esters, acetone, toluene, 2-butanone, and methylene chloride.
Temperature Blank	A sample container filled with water and labeled "Temperature Blank." The temperature blank is used by the laboratory to verify the temperature of the sample cooler at the time of laboratory receipt.	One per sample cooler	2 – 6 °C

7.3.1.3 Equipment Blanks

Equipment blanks are not required when dedicated sampling equipment is used. If non-dedicated sampling equipment is used in the collection of samples, one field blank will be collected for each type of equipment used for each day that it is used. Field blanks will be produced by pouring de-ionized water over and through the newly decontaminated equipment after it has been used to collect a field sample. Field records will be kept to identify the exact time and location of the field-blank sampling event so the blank can be associated with a specific sampling event.

7.3.1.4 Trip Blanks

Trip blanks are used to monitor potential sample volatile organic contamination during shipment to and from the laboratory. It also provides information on laboratory water quality since the laboratory provides the trip blank water. One trip blank will be submitted to the laboratory for analysis for each day aqueous volatile organic samples are collected. A trip blank will be included in each cooler containing volatile organic samples. Therefore, all volatile organic samples and containers will be shipped to and from the laboratory in a minimum number of coolers, minimizing the number of trip blanks required.

7.3.1.5 Field Testing QC

Field QC check control limits (pH, specific conductance, turbidity and immunoassay) are detailed below. In addition, field determinations of pH, specific conductance, and turbidity, are obtained in duplicate for every 20 samples "analyzed".

- pH: If the pH QC sample (pH 10.0 buffer after initial calibration with pH 4.0 and 7.0 buffers) exceeds ± 0.5 pH units from the true value, the source of the error is determined and the instrument re-calibrated. If a continuing calibration check with pH 7.0 buffer is off by ± 0.5 pH unit, the instrument is re-calibrated.
- Specific conductance: QC samples must be within +10% of the true values. The specific conductance QC sample is a 0.01 M or 0.1 M potassium chloride solution.
- Turbidity: QC samples must be within + 10% of the true values. The turbidity QC sample is a commercially prepared polymer standard (Advanced Polymer System Inc. or equivalent).
- Temperature: Temperature measurements are performed with a factory calibrated thermometer or thermocouple.

7.3.2 Laboratory Quality Control Samples

Laboratory quality QC samples are used to assess errors in the analytical process. In order to ensure that quality data are continuously produced during all analyses, and to allow compliance review, laboratory QC samples are analyzed to show that analytical results remain reproducible and that the analytical method is actually measuring the quantity of target analytes in each sample with acceptable bias.

7.3.2.1 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. A method blank is defined as an aliquot of laboratory deionized water on which every step of the method is performed and analyzed along with the samples. Method blanks are analyzed at a frequency of one (1) for every 20 samples analyzed, or every analytical batch, whichever is more frequent.

7.3.2.2 Spiked Samples

Two types of spiked samples are analyzed as part of the analytical QA/QC program, and include matrix spikes (MS) and matrix spike duplicates (MSD). Matrix spike samples are analyzed to evaluate instrument and method performance on samples of similar matrix. Matrix spike duplicates are analyzed to determine the precision of the method and instrument. These samples are analyzed and the percent recovery is determined to assess matrix interferences affects on the methods. One MS/MSD sample will be analyzed for every 20 samples.

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8.0 EQUIPMENT CALIBRATION AND MAINTENANCE

8.1 FIELD EQUIPMENT

8.1.1 Calibration

Field equipment that may be used during collection of environmental samples at the Site includes a pH meter, conductivity meter, turbidimeter, thermometer, dissolved oxygen meter and a photoionization detector (Photovac MicroTip, or equivalent). Calibration and standardization of the pH, specific conductivity, turbidity and dissolved oxygen meters is summarized below:

- The pH meter is calibrated in accordance with EPA Method 150.1. It is fully re-calibrated (three points) at least two times daily, and it is checked with pH 7 buffer every ten samples, two hours, or every time it has been turned off for more than two hours and then turned on again, whichever occurs first.
- The specific conductance meter is calibrated in accordance with EPA Method 120.1. It is calibrated at the beginning and in the middle of the work day.
- The turbidimeter is calibrated in accordance with EPA Method 180.1. It is calibrated at least twice daily following the manufacturer's operating instructions over a linear, non-drifting range of interest.
- The dissolved oxygen meter is calibrated following the manufacturer's instructions at least daily, and whenever the instrument has been turned off.
- Temperature is measured with a thermometer, or with a platinum electrode that has been factory calibrated and coupled to the pH meter.

The PID used for soil screening and health and safety surveys is calibrated following the manufacturer's instructions, at the beginning of the day, whenever the instrument is shut-off for more than two hours and at the field representative's discretion.

8.1.2 Maintenance

Preventive maintenance of field equipment is performed to keep all instruments in proper working order. This maintenance is monitored with a system of logbooks kept for each instrument. All preventative maintenance activities are recorded in the logbooks, along with documentation of any problems and repairs. Review of these logs and internal communication between QA/QC personnel and field personnel allow for identification and correction of potential problems.

Prior to field sampling events, each piece of field equipment is inspected to ensure it is operational. If necessary, the equipment is serviced. Meters requiring charged batteries are fully charged or have fresh batteries.

8.1.3 Cleaning of Field Sampling Equipment

All non-dedicated hand equipment and tools, including split spoons used to collect samples for chemical analyses (including trowels, spatulas, spoons, scoops, hand augers, split-spoons) will be decontaminated using the following procedures:

- Wash with citrus based cleaner;
- Tap water rinse or distilled/de-ionized water rinse;
- Hexane rinse (pesticide/PCB sampling equipment only);
- Tap water rinse or distilled/de-ionized water rinse;
- 10% nitric acid rinse (sampling equipment used for collecting samples for metals analysis only) and;
- Distilled/de-ionized water rinse.

If equipment is to be stored for future use, allow it to air dry, and then wrap it in aluminum foil (shiny-side out) or seal in plastic bags. Decontamination fluid will be discharged directly to the ground away from any surface water or containerized on-site if necessary

Drilling and Geoprobe equipment will be decontaminated by washing with a citrus-based cleaner and rinsing with tap water. If necessary equipment will be steam cleaned.

8.2 LABORATORY EQUIPMENT

All laboratory equipment is calibrated according to the requirements of the respective SW-846, Test Methods For Evaluating Solid Waste and the USEPA Chemical Analysis of Waters and Waste (1983) methods for each analysis and/or in accordance with the manufacturer's specifications.

In general, preventative maintenance of laboratory equipment follows the guidelines recommended by the manufacturer. A malfunctioning instrument is repaired immediately or through a service call to the manufacturer.

9.0 ASSESSMENT AND OVERSIGHT

9.1 PEER REVIEW

Peer review will be performed on all planning documents and final reports before delivery. The documents will be reviewed for technical adequacy, accuracy, compliance with technical procedures, contract and regulatory requirements, and editorial quality. Peer review will be documented as well as acceptance of responses to comments.

9.2 READINESS REVIEW

The Program Manager and QA/QC Manager shall conduct a readiness review before beginning field activities. The review will ensure that all plans have been completed and distributed, permits have been acquired, key personnel have been assigned and field personnel have been adequately trained, equipment is available and calibrated, arrangements have been made for waste disposal, and all possible precautions have been taken to prevent problems.

9.3 NONCONFORMANCE AND CORRECTIVE ACTION

The following sections describe who will be responsible for taking corrective actions to nonconformances identified during assessments or daily field or laboratory activities.

9.3.1 Field Activities

During the course of this project, it shall be the responsibility of the Project Manager, Field Manager, and field team members to see that all procedures are followed as specified in this QAPP and that measurement data meet the prescribed acceptance criteria. If a problem arises, it is imperative that prompt action be taken to correct the problem. Engineering and scientific calculations will be checked and corrected as required by technical personnel, and normally require no QA reporting. A nonconformance exists if there is a deviation from or noncompliance with contract specifications, the quality assurance program, approved procedures, or this QAPP. A nonconformance can also include major errors in documented analysis, data, or results, and deficiencies in documentation or any other aspect of the project that affects quality.

Personnel who identify a nonconformance should report the condition on a Nonconformance Report (NCR) and distribute the NCR to the Project Manager, and QC Manager. The identification numbers of the samples affected by the nonconformance should be noted on the NCR. The Project Manager and QC Manager shall:

- Review the NCR to determine whether ongoing work should be stopped; the nonconformance involves a major deviation from the contract or QAPP; may significantly impact the cost or schedule of the work; and/or the nonconformance has any impact on previously obtained data or reports submitted to the Client or other organization.
- Notify the Client Project Manager as soon as possible of the nonconformance.
- Note impacts to the project in the remarks section of the NCR and notify in writing all individuals and organizations that may be affected by the nonconformance and resulting data.

- Recommend corrective actions to resolve the nonconformance for review by the Client Project Manager. The approved corrective action will be implemented by appropriate personnel, and reviewed and approved by the Client Project Manager, Project Manager, and QC Manager.
- Ensure return to control by reviewing field activities after corrective actions have been implemented.

9.3.2 Laboratory Activities

Corrective actions shall be dictated by the type and extent of nonconformance. Corrective actions may be initiated and carried out by nonsupervisory staff, but final approval and data review by the laboratory QA Manager and Project Manager are necessary before reporting any information. All potentially affected data must be thoroughly reviewed for acceptance or rejection.

During the course of this project, it shall be the responsibility of the Laboratory Project Manager to see that all procedures are followed as specified in this QAPP and that measurement data meet the prescribed acceptance criteria. If a problem arises, it is imperative that prompt action be taken to correct the problem. A nonconformance exists if there is a deviation from or noncompliance with contract specifications, the laboratory's quality assurance program, approved methods or procedures, or this QAPP. A nonconformance can also include major errors in documented analysis, data or results, and deficiencies in documentation or any other aspect of the project that affects quality.

The Laboratory Project Manager shall prepare a Nonconformance Report (NCR) and distribute the NCR to the Project Chemist as soon as possible and no later than one working day after the nonconformance is identified. The identification numbers of the samples affected by the nonconformance should be noted on the NCR. The Project Chemist and QC Manager shall:

- Review the NCR to determine whether resampling is necessary; the nonconformance involves a major deviation from the contract or QAPP; may significantly impact the cost or schedule of the work; and/or the nonconformance has any impact on previously obtained data or reports submitted to the Client or other organization.
- Notify the Client Project Manager and Project Manager as soon as possible of the nonconformance.
- Note impacts to the project in the remarks section of the NCR and notify in writing all individuals and organizations that may be affected by the nonconformance and resulting data.
- Recommend corrective actions to resolve the nonconformance for review by the Client Project Manager and Project Manager. The approved corrective action will be implemented by appropriate personnel, and reviewed and approved by the Client Project Manager, Project Manager, and QC Manager.
- Ensure return to control by reviewing laboratory activities after corrective actions have been implemented.

9.4 QUALITY CONTROL SUMMARY REPORTS

The Project Chemist shall prepare a quality control summary report (QCSR) after completing data verification, review, and validation. The QCSR shall discuss the overall quality of the data, data usability, and any limitations of the data. Justifications for data qualifiers will be presented, as well as justifications for the rejection of any data. The QSCR shall reconcile the data collected with the project DQOs.

The QC Manager and Project Manager shall review the QCSR. The Project Manager shall provide the Client Project Manager with a copy of the reviewed QCSR for review and comment.

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10.0 DATA VERIFICATION, REVIEW, AND VALIDATION

The data verification, review, and validation process ensures and documents the quality of analytical data by verifying analytical data against method and QAPP specifications. The Project Chemist shall verify, review, and validate the data to assess the quality and usability of definitive data according to USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 1999) and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA, 2002). Based on the results of the verification, review, and validation and review process, data are categorized as fully usable, usable as qualified, or rejected.

10.1 LABORATORY DATA

The laboratory is required to meet all applicable documentation, data reduction, and reporting protocols as specified in the July 2005 NYSDEC ASP CLP deliverable format. Calculations of sample concentrations are performed using the appropriate regression analysis program, response factors, and dilution factors, where applicable. The laboratory (through its assigned QAO) conducts its own internal review of the analytical data generated for a specific project prior to sending the data to Earth Tech. Deficiencies discovered during the laboratory internal data validation, as well as the corrective actions used to correct the deficiency are documented in the laboratory Case Narrative submitted with each data package.

The laboratory reports the data in tabular form by method and sample. The laboratory is required to submit analytical results supported by a complete NYSDEC ASP CLP data package to enable the quality of the data to be determined. This standard backup data includes supporting documentation (chromatograms, raw data, *etc.*), sample preparation information, and sample handling information (*i.e.*, chain-of-custody documentation).

10.2 FIELD/ENGINEERING DATA

Field data (information collected in the field through observation, manual measurement, and/or field instrumentation) is recorded in the project field logbook, data sheets, and/or forms. This data is reviewed by the field manager and the project manager for adherence to the work plan and QAPP requirements. The final reporting of the data is reviewed by the project field personnel, who also participate in data reduction and evaluation.

Field documentation, data calculations, transfers, and interpretations are conducted by field personnel, and reviewed for accuracy by the appropriate task manager, project manager and/or QAO for:

- general completeness;
- readability;
- usage of appropriate procedures;
- appropriate instrument calibration and maintenance;
- reasonableness in comparison to present and past data collected;
- correct sample locations; and

- correct calculation and interpretations.

Approximately 5% of all calculations are checked through recalculation. If appropriate, field data forms, and calculations are included in project report appendices. Original field logs/forms, documents and data reduction are kept in the project file.

10.3 DATA VERIFICATION

The project chemist shall verify that all hard copy data packages received from the analytical laboratory are complete. The project chemist or designee shall verify that hard copy results correspond to electronic copy results for 10 percent of the data.

All hard copy data packages shall be checked to verify that the following items are included:

- Case narrative,
- Result and QC summary sheets,
- Initial and continuing calibrations,
- Method blanks (at least one per analytical batch),
- MS/MSD (one per batch),
- LCS/LCSD (one per analytical batch),
- Duplicate analyses (if applicable),
- Holding times,
- Instrument logs and preparation and extraction bench sheets,
- Linear range calculations (correlation coefficient), and
- Raw data.

10.4 DATA REVIEW

The data review process includes reviewing and evaluating 100 percent of the hard copy data for (1) extraction and analysis holding times, (2) surrogate recoveries, (3) reporting limits, (4) field duplicate RPDs, (5) blank detections, (6) LCS/LCSD recoveries and RPDs, (7) initial and continuing calibrations, (8) MS/MSD recoveries and RPDs, (9) instrument tuning and instrument performance, and (10) laboratory duplicate RPDs.

In addition to the laboratory's in-house review of the data, Earth Tech chemists will review the laboratory standard quality control summary forms prior to its incorporation into a final report and complete a Data Usability Summary Report (DUSR). The data review will follow the NYSDEC Guidance for Development of Data Usability Reports (Attachment E). A complete CLP data validation and associated report will be performed. Upon receipt of the laboratory data analytical package, the data reviewer:

1. **Reviews the data package to determine completeness.** It must contain all sample chain-of-custody forms, case narratives including sample/analysis summary forms, QA/QC summaries with supporting documentation, relevant calibration data, instrument and method performance data, documentation of the laboratories ability to attain the method detection limits for target analytes in

required matrices, data report forms with examples of calculations, and raw data. The laboratory is promptly notified of any deficiencies, and must produce the documentation necessary to correct the deficiencies within 10 calendar days.

2. **Reviews the data package to determine compliance with the applicable portions of the work plan**. The data reviewer confirms the data is produced and reported consistent with the QAPP and laboratory quality control program, protocol-required QA/QC criteria are met, instrument performance and calibration requirements were met, protocol required calibration data are present and documented, data reporting forms are complete, and problems encountered during the analytical process and actions taken to correct the problems are reported. Field duplicate data are evaluated to determine field variability.
3. **Prepares a tabular summary of the reported data.** The data reviewer summarizes the data in a tabular format to provide the data in more accessible format.

10.5 DATA VALIDATION

In addition to the data review described in Section 10.2, data validation includes validating 10 percent of hard copy data (per matrix, per method) through (1) recalculating results starting from raw data, (2) verifying identifications through evaluation of spectra and retention times, and (3) checking for omissions, discrepancies, transcription errors, dilution errors, and conversion errors.

10.6 DATA QUALIFICATION

Based on the data review and validation, the project chemist shall assign final data validation qualifiers to analytical results on both the hard copy results and in the electronic database. Final data validation qualifiers are based on the letter qualifier recommended in USEPA Functional Guidelines.

10.7 DATA VALIDATION REPORTS

Following data review or validation, the project chemist shall prepare a data validation report (DVR) for each hard copy data package. The DVR shall include a list of the samples and analytical methods included in the hard copy data package, a discussion all data qualifiers assigned, and a list of qualified results. All DVRs shall be peer reviewed.

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11.0 REFERENCES

NYSDEC. 1989. Analytical Service Protocols, September

United States Environmental Protection Agency (USEPA). 1996. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition, and its first, second, and third updates.

USEPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA 540/R-99/008. October.

USEPA. 2000. Guidance for the Data Quality Objective Process, EPA QA/G-4. August.

USEPA. 2001. EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5. March.

USEPA. 2002. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540-R-01-008.

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APPENDIX D
City of Schenectady
Temporary Water Discharge Permit

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CITY OF SCHENECTADY
NEW YORK
DEPARTMENT OF WATER

Room 206, City Hall
105 Jay Street
Schenectady, NY 12305
(518) 382-5023
FAX (518) 382-5100

RECEIVED
FEB 12 2007
EARTH TECH - ALBANY

February 8, 2007

Scott Underhill, PE
Earth Tech, Inc.
40 British American Blvd.
Latham, NY 12110

RE: TEMPORARY DISCHARGE PERMIT
GROUNDWATER DEWATERING AND REMEDIATION PROJECT
STRATTON AIR NATIONAL GUARD BASE
GLENVILLE, NY 12302

Dear Mr. Underhill:

We have reviewed your request for dewatering and treating groundwater at the above facility and to discharge treated groundwater from the treatment system to the City of Schenectady's Water Pollution Control Plant (WPCP). The City of Schenectady and Veolia Water will require schematics of the treatment system along with a site visit prior to commencement of discharge.

In accordance with City of Schenectady's Sewer Use Ordinance (SUO) we have established the following criteria for the discharge of treated groundwater from this dewatering operation:

1. There will be a $100.00 administrative fee made payable to the City of Schenectady to discharge treated groundwater to the City's system prior to the commencement of discharge.

2. There will be a $200.00 permit fee made payable to the City of Schenectady to discharge treated groundwater to the City's system.

3. Earth Tech, Inc. will notify Veolia Water via telephone (631-0073) at least eight hours in advance of any discharge to the City's sewer system of the treated groundwater.

4. An implementation schedule for the dewatering operation and the proposed groundwater remedial system should be submitted to the City of Schenectady and Veolia Water.

5. Monitoring samples should be analyzed every 20,000 gallons processed and reported to Joyce Edwards at Veolia Water and Yi-Mei Han at the City of Schenectady via fax. The attached table identifies the

monitoring requirements and frequency. Maximum allowable concentrations of the effluent wastewater will not be allowed to exceed those concentrations as shown on the attached Table.

6. Results of all analytical work is to be completed by an approved laboratory and shall be submitted to the City of Schenectady and Veolia Water as soon as possible. A final report after the dewatering is complete is required to be submitted to the City.

7. This temporary discharge permit will be valid for a period of **(90) ninety days** from the date of commencement of the start-up for the dewatering operation.

8. The applicant will abide by and conform to the City of Schenectady's Sewer Use Ordinance.

Should you have any questions, or require any additional information, please feel free to call Yi-Mei Han, at (518) 382-5082 or Joyce Edwards at (518) 631-0073.

Very truly yours,

Bernard R. Sisson, P.E.
City Engineer

Cc: Yi-Mei Han, GIS Coordinator
John Van Nordan, Corporation Council
Carl Olsen, Commissioner of General Services
Paul LaFond, Project Manager, Veolia Water
Joyce Edwards, IPP Coordinator, Veolia Water

Stratton ANGB

Effluent Parameter	Discharge Limitations	Units	Monitoring Frequency	Reference
Total Suspended Solids	350	mg/L	Once / 40,000 gallons	COS/SUO
pH	5.5 – 9.5	s.u.	Once / 40,000 gallons	COS/SUO
Arsenic	0.2	mg/L	Once / 40,000 gallons	COS/SUO
Barium	4.0	mg/L	Once / 40,000 gallons	COS/SUO
Beryllium	20.0	mg/L	Once / 40,000 gallons	COS/SUO
Cadmium	0.4	mg/L	Once / 40,000 gallons	COS/SUO
Chromium (total)	4.0	mg/L	Once / 40,000 gallons	COS/SUO
Copper	0.5	mg/L	Once / 40,000 gallons	COS/SUO
Cyanide (total)	1.6	mg/L	Once / 40,000 gallons	COS/SUO
Lead	0.2	mg/L	Once / 40,000 gallons	COS/SUO
Mercury	0.05	mg/L	Once / 40,000 gallons	COS/SUO
Molybdenum	0.5	mg/L	Once / 40,000 gallons	COS/SUO
Nickel	4.0	mg/L	Once / 40,000 gallons	COS/SUO
Phenolic compounds (total)	4.0	mg/L	Once / 40,000 gallons	COS/SUO
Polychlorinated Biphenyls (PCB)	1.0	mg/L	Once / 40,000 gallons	COS/SUO
Selenium	1.6	mg/L	Once / 40,000 gallons	COS/SUO
Zinc	2.0	mg/L	Once / 40,000 gallons	COS/SUO
Bis(2-Ethylhexyl)phthalate	2.8	mg/L	Once / 40,000 gallons	COS/SUO
Total Toxic Organics	2.13	mg/L	Once / 40,000 gallons	COS/SUO
Benzene	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
Ethylbenzene	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
Sum of Xylenes	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
Toluene	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
1,3,5-trimethylbenzene	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
1,2,4-trimethylbenzene	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
Cis 1,2-Dichloroethene	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
Tetrachloroethylene	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
1,1,1-Trichloroethane	100	ug/L	Once / 40,000 gallons	NYSDEC/DOW
Trichloroethene	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
Trichlorofluoromethane	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
Methylene chloride	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
Napthalene	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW
Pentachlorophenol	100	µg/L	Once / 40,000 gallons	NYSDEC/DOW

Amended on 3/21/2007 2:28 PM
Joyce E. Edwards

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