workplan.hw734054.2010-08-01.AddendumSite15SupplementalRI-PilotTest

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 174TH FIGHTER WING (ANG)
6001 EAST MOLLOY ROAD
SYRACUSE, NEW YORK 13211-7099

30 August 2010

Mr. Robert Corcoran
Environmental Engineer 2
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, 11th Floor
625 Broadway
Albany, New York 12233-7015

RECEIVED
SEP - 3 2010
BUREAU OF EASTERN
REMEDIAL ACTION

RE: Task 1C Deliverable – August 2010
Final Work Plan Addendum – Site 15
Supplemental Remedial Investigation/Pilot Test
174th Fighter Wing - Hancock ANG Base
Site 15 Interim Remedial Action
Syracuse, New York

Dear Mr. Corcoran:

On behalf of the 174th Fighter Wing at the Hancock Air National Guard Base, Environmental Resources Management (ERM) is pleased to provide the New York State Department of Environmental Conservation (NYSDEC) with one copy and one computer disk (CD) containing the above referenced Final Work Plan Addendum dated August 2010. The Final Work Plan Addendum has been revised to incorporate the NYSDEC and New York State Department of Health (NYSDOH) comments on the Draft Final Work Plan Addendum.

For clarity of review, NYSDEC and NYSDOH comments on the Draft Final Work Plan Addendum are presented in Attachment A. ERM's responses follow each comment in blue text. Revisions referenced in Attachment A are incorporated into the appropriate pages of the Final Work Plan Addendum presented on the accompanying copies.

If you have any questions, please contact me on my office phone at (315) 233-2111.

Sincerely;

Brent R. Lynch, GS-12, NYANG
Environmental Engineer

From: Bob Corcoran [mailto:rkcorcor@gw.dec.state.ny.us]
Sent: Thursday, August 26, 2010 2:28 PM
To: Dave Myers
Cc: John Swartwout
Subject: Hancock ANG Data-gap work plan comments

Dave,

As per our phone discussion yesterday, here are DEC's comments on the *Draft Final Work Plan Addendum: Site 15 Supplemental Remedial Investigation / Pilot Test (dated July 2010).*

1) Page 1-1, last paragraph: Please add NYS's Soil Vapor Intrusion guidance to the list of referenced guidance documents. Reference added as requested.

2) Page 2-1, General Approach for Groundwater Sampling: In accordance with DER-10 appendix 1a, "Periodic monitoring for VOC will be required during non-intrusive activities such as ... the collection of groundwater samples from existing monitoring wells..." Please add a step where monitoring well head space will be analyzed for VOC upon opening, to the sampling process. Revised as requested.

3) Page 2-2, General Approach for Indoor Air Sampling: It is recommended that indoor air sampling be conducted during the fall/winter heating season, a time which represents 'worst-case' conditions for indoor air evaluation. Indoor air events to be performed in the October to December time frame.

4) Page 3-4, Section 3.5 Indoor Air Sampling Procedures, first paragraph: As per NYS SVI guidance, sub-slab vapor samples should be collected from 2 inches below the floor slab, not 3-24 inches as stated. Also, if possible, the outdoor ambient air sample should be collected near the air intake(s) of the building HVAC system. Sampling protocol revised as requested.

5) Page 3-4, Section 3.5 Indoor Air Sampling Procedures, second paragraph: The correct section of the NYS SVI guidance for reference is 2.7.2, not 2.7.1 as stated. Again, the sub-slab sampling zone is approximately 2 inches below the floor slab. Please refine the sampling procedure outlined in this section. Sampling protocol revised as requested.

6) Figure 4-1, task 2A- Indoor Air Evaluation: Preliminary and validated air results, as well as completed building questionnaires and product inventories should be provided to the NYSDEC and NYSDOH as soon as they are available to facilitate the transmittal of the results to the property owner in the 30-day mandated time frame. It is also helpful if the draft transmittal letter is submitted for review at the same time, or shortly after, the validated results are. Additional information relative to this issue has been added as the first paragraph of Section 3.5. Figure 4-1 has been revised to provide the appropriate project schedule.

7) As we discussed over the phone, the data validation must be conducted by a third party not associated with the lab doing the sample analysis. He or she must have a resume on file DEC and be approved to perform the data validation - See Appendix 2B of DER-10 for DUSR requirements. See response to Item 8, below.

Below are some comments from our chemist on the Appendix B - Quality Assurance Project Plan-QAPP

8) Page B-4

A current resume of the QAO should be provided for review and approval if she is going to prepare the Data Usability Summary Report (DUSR). This requirement is outlined in Appendix 2B of DER-10. Ms. McGinness' resume is attached to the NYSDEC copy of these comments/response for their review and approval.

9) Page B5-11, B5-13, B6-3, B6-6

The NYSDEC June 2000 Analytical Services Protocol (ASP) is referenced. The current version is dated July 2005. Current version corrections made as requested.

10) Page B6-5

Reference Appendix 2B of DER-10 for DUSR requirements. Revised as requested.

11) Page B7-1

Delete reference to "CLP". ELAP CLP Tier certification no longer exists and is therefore not required. References removed as requested.

12) Appendix E

The TestAmerica Sample Handling Guide provides technical holding times that differ from ASP sample holding times. Samples should adhere to the holding times in the July 2005 NYSDEC ASP. Test America sheet to be revised and will adhere to July 2005 NYSDEC ASP.

Please contact me with any questions on these comments.
Regards,

Bob

Robert Corcoran, P.E.
Environmental Engineer 2
NYS DEC
Div. of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway, 11th Floor
Albany, NY 12233-7015
Phone: (518) 402-9620
Fax: (518) 402-9022

Melissa A. McGinnis, REPA

Ms. McGinnis has over eleven years of professional experience in several environmental areas. During this time she has completed various types of environmental laboratory work, including the operation of both atomic absorption spectrophotometry (AAS) and inductively-coupled plasma (ICP) analytical instruments to test water, soil, and sludge samples for a wide range of metals. Ms. McGinnis' laboratory work also included the preparation of Analytical Services Protocol (ASP) Category B data packages. Additionally, Ms. McGinnis is proficient in laboratory data validation and has completed numerous Data Usability Summary Reports (DUSRs) for a variety of project sites.

Ms. McGinnis has assisted with and coordinated numerous large environmental remediation projects, completing tasks such as work plan development, correspondence with the New York State Department of Environmental Conservation (NYSDEC), document reviews, regulatory standard review, and Material Safety Data Sheet (MSDS) review. Ms. McGinnis has also conducted a wide variety of environmental field work including soil and ground water sampling; industrial hygiene (IH) sampling; and oversight of underground storage tank removal and remediation.

Ms. McGinnis has acted as the technical and field team leader for multiple Phase I and Phase II Environmental Site Assessments (ESAs), as well as compliance assurance projects, and projects involving regulatory report preparation and submittal. Ms. McGinnis has served as both a key team member and project manager for several large due diligence portfolios for regional and global clients. These project scopes included desktop reviews, Phase I ESAs, compliance and environmental health & safety (EHS) audits, and/or Phase II ESAs.

Registration/Training/Certifications

- Certified Registered Environmental Property Assessor (REPA) by the National Registry of Environmental Professionals (NREP)
- Completion of McCoy's 5-day RCRA Training Seminar
- OSHA 40-Hour Hazardous Waste Operations Certified
- American Red Cross First Aid and CPR Certified
- Completion of ASTM's *Environmental Site Assessments for Commercial Real Estate* course
- Completion of online course, *Regulatory Literacy,* by Lion Technology, Inc.
- Completion of *Phase II Storm Water Regulation and Compliance* seminar, presented by Lorman® Education Services
- Completion of *Oil SPCC Update: How do the Ongoing Changes Affect You?* Seminar, presented by Lorman® Education Services

Fields of Competence

- Environmental Laboratory Protocols
- Laboratory Data Review & Validation
- Phase I & Phase II ESAs and EHS Audits
- SARA Regulatory Compliance
- Air Permitting and Reporting
- Hazardous Waste Management
- SPCC Plan & SWPPP Preparation

Education

- B.S., Environmental Science, Chemical Engineering Concentration; University of Rochester, 1999

Key Projects

Completed NYSDEC Analytical Services Protocol (ASP) projects for clients, which included the preparation and analysis of samples for metals parameters, review and analysis of sample data, and organization of the results in accordance with ASP regulations.

Completed laboratory data review and Data Usability Summary Report (DUSR) preparation for various one-time field sampling events and long-term field projects.

Completed Phase I ESAs and limited EHS and compliance audits for numerous industrial clients in diverse sectors. Project roles have included project manager, lead assessor, and key project team member.

Participated as a key member of a global project team to complete Phase I ESAs, EHS and compliance reviews, and Phase II Site Assessments as part of large due diligence portfolio consisting of 90 sites worldwide.

Reviewed all environmental programs and prepared appropriate regulatory documents to achieve compliance with NYSDEC requirements while seconded to a major manufacturing client in central New York.

Prepared Spill Prevention, Control, and Countermeasure (SPCC) plans and Storm Water Pollution Prevention Plans (SWPPPs) for several key clients.

Provided over two months of oversight on the behalf of the New York State Department of Environmental Conservation (NYSDEC) for a large-scale coal tar remediation project.

Assisted in all stages of hazardous waste collection and disposal at a hazardous waste facility, including tagging and logging in of waste containers and electronic tracking of the waste.

Managed a compliance assurance project involving renewal of the client's State Pollutant Discharge Elimination System (SPDES) permit and updating the client's existing SPCC Plan and SWPPP to comply with current regulations.

Completed and submitted SARA regulatory reporting forms for industrial clients in various U.S. states. Several of these projects involved the development of comprehensive, client-specific calculation spreadsheets, including detailed instructions and regulatory citations.

Completed air permitting work, including air emissions inventories, air emissions calculations, regulatory report preparation, and permit renewal tasks, for various industrial clients.

Conducted several IH sampling events (including employee exposure sampling and noise surveys) in both industrial and laboratory settings and assisted with the development of innovative report templates for the presentation of sample results to the clients.

Managed and assisted with Phase II Site Assessments for numerous industrial clients in diverse sectors.

Assisted with the planning and coordination of Phase II investigations at two large industrial sites. Tasks included preparation of cost estimates, proposal preparation, work plan development, and scheduling of subcontractor work.

Conducted site assessments at petroleum spill sites in several northeastern states, including on-site inspections, preparation of assessment reports, and follow-up visits including oversight of remedial subcontractors.

Directed the disposal of regulated waste at a petroleum waste site. Tasks included coordination of the site work, manifestation, and documentation of site conditions and activities.

Managed a project involving the implementation of an environmental compliance audit software package. Services included translation of electronic files and analysis of federal and state environmental regulations.

Compiled, tabularized, and reviewed analytical data and compared the data to regulatory standards for several large environmental remediation projects.

Environmental Restoration Program
Final Work Plan Addendum
Site 15 Supplemental Remedial Investigation/Pilot Test

174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

August 2010

NGB/A7OR
Andrews AFB, Maryland

Environmental Restoration Program
Final Work Plan Addendum
Site 15 Supplemental Remedial Investigation/Pilot Test

174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

August 2010

RECEIVED
SEP - 3 2010
BUREAU OF EASTERN
REMEDIAL ACTION

Prepared For:

Air National Guard
3500 Fetchet Avenue
Andrews AFB, Maryland

Prepared By:

ERM-Northeast, Inc.
5788 Widewaters Parkway
DeWitt, New York 13214

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

Acronym	Definition
µg/L	Micrograms per liter
ANG	Air National Guard
BEX	Benzene, Ethylbenzene, and Total Xylenes
bgs	Below ground surface
DGI	Data Gap Investigation
EPA	United States Environmental Protection Agency
ERM	ERM-West, Inc.
FW	Fighter Wing
GE	General Electric
HASP	Health and Safety Plan
LNAPL	Light Non-Aqueous Phase Liquid
ND	Non-detect
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
VOCs	Volatile Organic Compounds

Section 1

Section 1

SECTION 1.0

INTRODUCTION

This Work Plan Addendum (Work Plan) has been prepared for the Environmental Restoration Program at the 174th Fighter Wing (FW) of the New York Air National Guard (ANG) in Syracuse New York. This Work Plan is an addendum to the *Final Site 15 Supplemental Remedial Investigation/Pilot Test Work Plan* (ERM-West, Inc. [ERM] 2008). This Work Plan was completed under Task 1A of Delivery Order 0137 under National Guard Bureau contract DAHA92-01-D-0005 between ERM and the National Guard Bureau, Departments of the Army and Air Force.

1.1 Objectives and Scope of Work

This Work Plan addresses additional data gap investigation (DGI) activities that will be conducted at Site 15 of the 174th FW. The scope of work will consist of conducting a complete round of groundwater monitoring at Site 15, and an indoor air evaluation at the Ram-Tech Engineering Corporation of Syracuse (RamTech) facility.

The objectives of the groundwater monitoring and indoor air evaluation are to:

- Evaluate the effectiveness of enhanced natural attenuation in treating benzene, ethylbenzene, and total xylenes (BEX) in groundwater;
- Verify that the BEX plume is not migrating onto down-gradient properties; and
- Determine whether the volatile organic compounds (VOCs) detected in the October 2009 soil survey have impacted the RamTech facility work environment.

All activities will be conducted in accordance with the United States Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYSDEC) guidance documents, and ANG requirements.

1.2 Site Description and History

The 174th FW of the New York ANG is based at Syracuse Hancock International Airport, an active international airport and former Air Force Base located approximately 2 miles north-northeast of the City of Syracuse in Onondaga County (Figures 1-1 and 1-2). The 174th FW is located south of the municipal airport, and is operating within the southern portion of the former Hancock Air Force Base. The 174th FW provides air reconnaissance for the eastern portion of the United States. Facilities on the 174th FW include aircraft hangers, and support, office, and maintenance buildings. The 174th FW is bordered by the airport to the north, the Town of Dewitt to the east and south, and the Town of Salina to the west.

Site 15 formerly contained a pump house for the Petroleum, Oil and Lubricants area. It is approximately 2.5 acres in area, and consists of brush and wooded vegetation, a large concrete pad, a formerly bermed area that contained a 215,000-gallon above-ground tank, and two drainage swales. The two separate drainage swales border Site 15 to the north-northeast and west. The drainage swales intermittently contain rain water intermittently following storm events. Water within the drainage swales does not appear to be hydraulically connected to underlying groundwater (Parsons 2004).

Site 15 has sustained historical spills of polychlorinated biphenyls and jet propulsion (JP)-4 and (JP)-8 military aviation fuels. Several structures (a transformer pad, the foundation of the former pump house, six underground tanks, three drainage sumps, and an oil-water separator) were removed in 2003 as part of a removal action for polychlorinated biphenyl-impacted soils (Parsons 2004).

1.3 Surrounding Land Use

The surrounding land use is currently a mix of recreational, industrial, commercial, and residential properties within one-quarter mile south of the 174th FW. Property to the west, north, and east of the 174th FW are used for military and transportation purposes. Land directly south of Site 15 (across Molloy Road) is used for a golf course. Overall land use in the vicinity of Site 15 has not changed significantly in the last 30 to 40 years and is not expected to change significantly in the foreseeable future.

1.4 Geology

The surficial geology at Site 15 consists of glacial sediments deposited by glacial meltwater overlying poorly sorted till deposited directly by glaciers. The glaciofluvial sediments include silty clays, sands, and gravels, with thickness ranging from 45 to 55 feet. The underlying till consists of gravel, cobbles, and boulders entrained in a silty clay matrix and ranges in thickness from 30 to 100 feet (Lockheed 1997). Bedrock is encountered at depths ranging from 75 to 109 feet below ground surface (bgs), and is one of the Upper Silurian Vernon Formation. This formation consists of thinly bedded soft red shale with thin beds of green shale, gypsum, halite, and dolomite within the Salina Group. Competence varies from soft and crumbly to dense and hard. The degree of competence appears to be proportional to the density of the fractures in the shale. The shale is characterized by enlarged fractures, joints, and bedding planes (Lockheed 1997).

1.5 Hydrogeology

Site 15 is located in a coastal plain containing glaciated sediment. Visual observations of soil type indicate, in order from shallow to deep, continuous silty clay for the top 10 to 15 feet followed by 5 to 10 feet of silty sand and then clayey silt and a second silty sand zone. Groundwater is generally encountered within the silty clay at depths of 5 to 11 feet bgs during the spring season and at depths of 9 to 15 feet bgs during the fall season.

Based on October 2009 groundwater monitoring data, groundwater at the 174th FW and in the Pilot Test area appears to flow in a southeasterly direction (Figure 1-3) towards the North Branch of Ley's Creek, then flows generally to the south-southwest where it joins Ley's Creek. Ley's Creek flows generally south-southwest and ultimately discharges into Onondaga Lake.

1.6 Summary of October 2009 Groundwater Monitoring

A complete groundwater monitoring event (30 wells total) was conducted by ERM during the week of 5 October 2009. All monitoring well locations are presented in Figure 1-3. Laboratory data associated with the groundwater monitoring event are presented in Table 1-1. The groundwater analysis indicated BEX concentrations below laboratory method reporting limits in 20 of the 30 monitoring wells. Concentrations of BEX above applicable Standards, Criteria, and Guidance levels were present in the following 10 wells: MW-2, MW-11, MW-14, MW-15, MW-19, MW-22, MW-101, MW-103, MW-105, and MW-112. Benzene concentrations in these 10 wells ranged from non-detect (ND) to 49 micrograms per liter (µg/L). Total BEX concentrations are presented in Figure 1-4.

Figure 1-5 shows the lateral extent of benzene in groundwater based on October 2009 data, and relative to the NYSDEC ambient groundwater quality standard of 1 µg/L (NYSDEC 1998). The highest concentration of benzene was found in the area immediately north of Molloy Road on the ANG property.

Figure 1-6 illustrates the distribution of dissolved ethylbenzene based on October 2009 data, and relative to the NYSDEC ambient groundwater quality standard of 5 µg/L. Ethylbenzene concentrations in the 10 wells ranged from ND to 380 µg/L. Ethylbenzene concentrations were highest in the vicinity of well MW-19, located north of Molloy Road on the ANG property.

Figure 1-7 shows the distribution of dissolved xylenes based on October 2009 data, and relative to the NYSDEC ambient groundwater quality standard of 5 µg/L. Xylene concentrations in the 10 wells ranged from ND to 420 µg/L. Xylene concentrations were highest in the vicinity of well MW-19, located north of Molloy Road on the ANG property.

Based on the results of the additional investigation previously described in the *Final Technical Memorandum Supplemental Remedial Investigation/ Pilot Test* (ERM 2010), the extent of benzene, toluene, ethylbenzene, and total xylenes in groundwater has been delineated on the Hancock ANG and Brooklawn Golf Course properties, and on the RamTech property with the plume dissipating within the boundaries of the General Electric (GE) property.

1.7 Summary of October 2009 Soil Vapor Study

ERM performed a soil vapor survey on 5 and 6 October 2009 at three locations (Figure 1-8). A soil vapor sample was collected adjacent to the west and south exterior walls of the RamTech Building, and from one location along RamTech's southern property line (northern boundary of

GE) proximal to the building located on the GE property. Soil vapor samples were collected from a depth consistent with a typical commercial building footer (approximately 3 to 4 feet bgs) or a minimum of 1 foot above groundwater. In addition, an ambient outdoor air sample was collected up-wind during soil vapor sampling activities. The samples were used to evaluate the potential for vapor intrusion risks in the buildings.

The State of New York currently does not have Standards, Criteria, and Guidance levels for concentrations of VOC in subsurface vapors. Additionally, there are no current databases available with background levels of VOC in soil vapor. In the absence of this information, soil vapor sampling results are reviewed "as a whole," in conjunction with the results of other environmental sampling and Site 15. To put some perspective on the data, the New York State Department of Health (NYSDOH) and NYSDEC often compare the soil vapor results to the NYSDOH's background database that was used to evaluate outdoor air data (NYSDOH 2006).

The results of the soil vapor survey conducted on the RamTech property are summarized in Table 1-2 below. The survey was conducted to characterize the nature and potential extent of subsurface vapor impact on the property. The results of the soil vapor survey are compared to a statistical evaluation of background concentrations of VOC in outdoor air which are summarized in the *Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes* (NYSDOH 2003).

TABLE 1-2

2009 Soil Vapor Survey Results

Identification	*Benzene*	*Ethylbenzene*	*m,p - Xylene*	*o- Xylene*
SV-06	2.14	0.97	0.90	0.57
SV-07	3.43	**3.12**	**4.19**	**2.92**
SV-08	**12.1**	1.08	1.14	0.61
Ambient	<0.79	<0.39	<0.39	<0.39
Indoor 90th	15	7.4	12	7.6
Outdoor 90th	4.3	1.1	1.4	1.7

(Concentrations in micrograms per cubic meter)

The bolded concentrations in Table 1-2 indicate concentrations that exceed the background outdoor air concentrations of 90 percent of samples collected in the NYSDOH study. According the NYSDOH, soil vapor data alone typically can not be relied upon to rule out the potential for vapor intrusion in buildings. Based on the evaluation of soil vapor and groundwater data collected in the vicinity of the RamTech building, ERM recommended that an indoor air evaluation be performed.

1.8 Work Plan Structure

This Work Plan was written in general conformance with the guidelines presented in the *ANG Investigation Guidance* (ANG 2005). It provides a description of the planned activities and is organized as follows:

- Section 1.0 - Introduction;
- Section 2.0 - Investigative Approach;
- Section 3.0 - Sample Collection Procedures;
- Section 4.0 - Project Schedule and Deliverables;
- Section 5.0 - References;
- Appendix A - Addendum to the Health and Safety Plan (HASP); and
- Appendix B - Addendum to the Quality Assurance Project Plan (QAPP).

Section 2

SECTION 2.0

INVESTIGATIVE APPROACH

This section describes the investigative approach for the 2010 DGI conducted at the 174th FW.

2.1 General Approach for Groundwater Sampling

ERM will perform one groundwater monitoring round that will include a total of 30 wells located on and around Site 15. All groundwater sampling will be performed by low-flow methodology in accordance with applicable federal, state, and local regulations. In accordance with NYSDEC DER-10, Appendix 1A, *Final Technical Guidance for Site Investigation and Remediation*, ERM will periodic monitoring the head space of the monitoring wells and the ambient air space for the presence of VOCs with a calibrated photoionization detector (PID).

Groundwater samples will be analyzed for BEX and natural attenuation parameters. The field work will also include the following:

- Well identification;
- Annotation of well condition;
- Measurement of water levels;
- Field parameters such as pH, specific conductance, dissolved oxygen, temperature;
- Maintenance and/or repair of existing wellhead completions as necessary; and
- Completion of the groundwater monitoring well inventory form, or update as appropriate, in accordance with ANG guidance.

Groundwater samples and associated Quality Assurance/Quality Control (QA/QC) samples collected from the 30 wells will be analyzed by an approved laboratory. QA/QC shall be consistent with EPA Level III requirements.

All analyses will be conducted in accordance with the EPA methods and techniques listed below:

- BEX by EPA Method 8260
- 353.2 Nitrogen, Nitrate-Nitrite;
- 300.0 Sulfate;
- SM 2320B Alkalinity;
- SM 2340C Hardness;
- SM 4500 NH3 E Ammonia; and
- RSK-175 Methane.

2.2 General Approach for Indoor Air Sampling

ERM will perform two separate indoor air monitoring events (one in the early fall (September-October) of 2010 and one during the late fall (November-December) 2010). A total of seven air and vapor samples will be collected at the location approved by the operating officer of the RamTech Facility.

- Two sub-slab vapor samples (one sample and a duplicate);
- Four indoor air samples, including two 24-hour active samples (one sample and a duplicate) and two 30-day passive samples (one sample and a duplicate); and
- One outdoor air sample (background).

Active samples will be backed up with a second tube. A total of 16 samples (two events of seven samples plus a blank with each event) will analyzed for both monitoring events. All sampling activities will be performed by ERM. Sampling equipment necessary for the collection of the vapor samples from the air, and the sub-slab sampling ports on the sorbent tubes, will be provided by Vapor Trail Analytical of Rochester, New York. The proposed analytical methodology will employ active sampling of VOCs onto stainless steel sorbent tubes, followed by Thermal Desorption Gas Chromatographic-Mass Spectrometric analysis. The standard practices to be utilized are described in the EPA Method TO-17 (active collection and all analysis) and the diffusive section of the

American Society for Testing and Materials Procedure D 6196-03 (passive collection).

ERM will collect samples over two time intervals: 24 hours and 30 days. The 24-hour sampling event will be conducted in active mode using sampling pumps at a nominal flow rate of 20 milliliters per minute. The 30-day sampling will be collected in passive mode using axial diffusive sorbent tubes. The reporting of up to 20 tentatively identified compounds is included for the passive collection sampling event. Trip blanks for each sampling event will also be analyzed.

2.3 Access Agreements

It is ERM's understanding that Ms. Patricia A. Smith, Real Property Examiner, 174th FW Hancock Field, is in the process of obtaining a Site Access Agreement with the owner of RamTech to enable ERM to perform the indoor air evaluation within their facility. RamTech and adjacent properties including the following: Paper Conversions; the Brooklawn Golf Course (Mr. Guy Easter); and National Grid have already provided Access Agreements for monitoring wells on their properties.

ERM has provided Ms. Smith with copies of ERM's DGI Proposal, dated April 2010. Ms. Smith indicated that the approval process for paper work submitted for the Site Access Agreement may take approximately 6 to 8 weeks. Based on the project timeframe, field activities are estimated to begin on 16 August 2010. If required, ERM will provide an updated insurance certificate that lists the requested property owners as additionally-insured parties.

2.4 Health and Safety

Prior to field activities, field personnel will be briefed of health and safety issues associated with the DGI in a Level II Health and Safety Short form. The Level II Health and Safety Short form is a supplement to the HASP included in the *Final Site 15 Supplemental Remedial Investigation/Pilot Test Work Plan* (ERM 2008). The Addendum to the HASP is presented in Appendix A.

2.5 Field Quality Assurance/Quality Control

Several types of field QC samples will be collected and submitted for analysis. Each type of QC sample monitors a different aspect of the field effort, and analytical results provide information regarding the adequacy of the sample collection and transportation. Collection of QC samples will be performed in accordance with the QAPP provided in the *Final Site 15 Supplemental Remedial Investigation/Pilot Test Work Plan* (ERM 2008). The Addendum to the QAPP is presented in Appendix B.

Section 3

Section 3

SECTION 3.0

SAMPLE COLLECTION PROCEDURES

3.1 Groundwater Sampling Procedures

The groundwater monitoring event will be completed at approximately the same time as the second indoor air sampling event (October 2010). The wells will be sampled in general conformance with EPA low-flow (minimal drawdown) well purging and sample collection techniques (EPA 1996). The low-flow groundwater purging/sampling technique employs the use of a flow-through cell equipped with probes connected to an electronic water quality meter for measuring parameters such as pH, temperature, conductivity, dissolved oxygen, and oxidation reduction potential. Examples of water quality meters that may be used include the Horiba U-22 and the YSI 600XL.

The following general procedure will be used for groundwater sampling:

- Monitoring wells and the recovery wells shall be located in the field and opened to allow access for sampling activities. The exterior of each well shall be visually inspected for signs of damage or tampering and relevant information will be recorded in a field notebook or an appropriate field form.

- Field personnel shall wear appropriate health and safety equipment as outlined in the Level II Health and Safety Form. Field personnel will put on new, clean sampling gloves at each individual well location prior to sampling.

- The locking well cap shall be unlocked, and the concentration of VOCs at the top of the well riser will be measured with a calibrated photoionization detector with a (minimum) 10.2-electrovolt lamp.

- Depth to water and the depth to the bottom of the well will be measured to the nearest 0.01-foot using an electronic water level indicator or an interface probe. The water level indicator or the interface probe will be cleaned between wells using decontamination procedures described in the *Final Site 15 Supplemental Remedial Investigation/Pilot Test Work Plan* (ERM 2008).

- If light non-aqueous phase liquid (LNAPL) is encountered on the top of the groundwater table, the thickness of LNAPL will be measured using an interface probe. Groundwater samples will not be collected from wells that contain LNAPL.

- Adjustable-rate, positive displacement pumps (e.g., centrifugal pumps or bladder pumps constructed of stainless-steel or Teflon®) or peristaltic pumps will be utilized for purging/sampling of each well. The pump and dedicated tubing will be slowly lowered into the well to a depth corresponding to the saturated portion of the screened interval. The pump intake shall be kept at least 6-inches above the bottom of the well to prevent mobilization of any sediment.

- The water level will be measured again before starting the pump. Wells will initially be pumped at a rate of 50 to 600 milliliters per minute. Ideally, the pumping rate should cause minimal (less than 0.3 feet) water level drawdown in the well and the water level should stabilize.

- Depth to water and pumping rate shall be measured and recorded approximately every 5 minutes (or as appropriate) during pumping. If purging continues for more than 30 minutes, readings will be recorded at approximately 10 minute intervals.

- During purging, the field indicator parameters turbidity, temperature, specific conductance, pH, oxidation reduction potential, and dissolved oxygen shall be measured and recorded every 5 minutes or as appropriate based on field conditions. If purging continues for more than 30 minutes, readings will be recorded at approximately 10 minute intervals.

- Pumping rates will be adjusted to minimize drawdown and/or to facilitate stabilization of field parameters as required.

- Purging will cease when the turbidity has dropped below 50 nephelometric turbidity units and/or field parameters have stabilized as follows for three consecutive readings:
  - ±0.1 for pH;
  - Temperature ±0.1 degree Celsius; and
  - ±10 percent for specific conductance (conductivity).

- If drawdown in the well is measured at 1-foot or greater continue low-flow purging until a minimum of one well casing volume is removed using the flow equation to calculate the volume of groundwater purged from the well.
- Before sampling, the flow-through cell will be disconnected or a bypass assembly will be used to collect groundwater samples before the flow-through cell. Each of the sample containers will be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence and agitation.
- Sample bottles will be labeled using waterproof pens. All samples will be placed into a pre-chilled cooler for subsequent delivery to TestAmerica of North Canton, Ohio, an Environmental Laboratory Approved Program certified laboratory for analyses.

3.2 Sample Handling Procedures

After samples are logged in the field, they will be stored in a cooler containing ice pending delivery to the analytical laboratory. Sample coolers will generally be hand-delivered to the project laboratory. However, in cases where the samples will be shipped to the laboratory via overnight courier, the shipping container (i.e., cooler) will be secured using a signed custody seal to document that the cooler was not accessed by unauthorized personnel during transit.

3.3 Laboratory Analytical Methods

Groundwater samples will be analyzed for BEX by EPA Method 8260. In addition, all monitoring wells will be analyzed for the following natural attenuation parameters to evaluate the performance of the Pilot Test:

- 353.2 Nitrogen, Nitrate-Nitrite;
- 300.0 Sulfate;
- SM 2320B Alkalinity;
- SM 2340C Hardness;
- SM 4500 NH3 E Ammonia; and
- RSK-175 Methane.

All natural attenuation parameters listed above will be analyzed at an approved laboratory using EPA-approved or standard methods. In addition, the samples will be field-tested for ferrous iron using a Hach Model IR-18C ferrous iron test kit (1,10-phenanthroline iron reagent method). The results of ferrous iron analyses will be recorded in the field notebook and/or on appropriate sampling forms.

3.4 Quality Assurance

Groundwater sampling, sample handling, and laboratory analysis will be performed in accordance with the previously accepted QAPP.

3.5 Indoor Air Sampling Procedures

ERM will conduct a pre-sampling inspection of the main level of the building prior to the sampling event to identify and minimize building factors or conditions that may interfere with the proposed investigation. Information on floor slab layout and condition, construction characteristics, general air flow characteristics, HVAC systems, other potentially relevant physical conditions, and potential sources of VOCs inside the main building will described and documented on a building inventory form. Chemicals or other products used in the building for routine office activities and/or maintenance operations will be documented on the building inventory form. A calibrated PID will be used to collect readings at selected areas inside the building. To the extent practicable, reasonable effort will be made to avoid activities inside the building that may interfere with or dilute ambient indoor air within 24 hours before and during the investigation, such as opening of windows, vents, use of ventilation fans, painting, cleaning, waxing, or polishing with petroleum-or oil-based products, application of pesticides, caulking, or use of bituminous or other organic materials in building maintenance.

ERM will perform two indoor air sampling events (early fall 2010 and late fall 2010) at the location shown on Figure 3-1. Please note the duplicate sample will be obtained from the same location as the proposed sample. At this location, one sub-slab sample and one "room" sample will be collected.

The sub-slab indoor air samples will be installed and collected as per Section 2.7.2 of the *Final Guidance for Evaluating Soil Vapor Intrusion in the*

State of New York (NYSDOH 2006). A 1-inch diameter hole will be drilled to a depth of approximately 4-inches into the concrete floor slab using an electric hammer drill. A ½-inch drill bit will be used to drill through the remaining thickness of the slab and not more than 2-inches into the sub-slab material. A section of ¼-inch outside-diameter (O.D.) Teflon™ tubing will be installed to a depth just below the bottom of the concrete slab. The annular space between the 1-inch hole and ¼-inch tubing will be sealed with melted beeswax. A calibrated PID will be used to purge approximately 1-liter of gas from the subsurface and peak PID readings during purging will be recorded on the sampling form. A helium tracer gas will be used to determine if ambient air is being drawn into the sampling zone. The Teflon™ tubing will then be attached to the stainless steel sorbent tubes equipped with a 24-hour flow controller.

Sub-slab, background outdoor air and "room" indoor air samples will be collected in axial sorbent tubes using positive displacement pumping. Sorbent methodology uses EPA Method TO-17 to analyze soil vapor samples for the presence of VOCs and for this application the analytes are limited to BEX plus the analytes as shown on the analyte list in Appendix E of the QAPP. Method TO-17 is an approved analytical method in the *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH 2006). At the same time, a passive (no pump) 30-day sample will be initiated and collected in axial sorbent tubes.

The pumps will run approximately a 24-hour sampling period and all QA/QC samples associated with the method will be collected. The collected indoor air samples will be logged and transported under chain-of-custody to Vapor Trail Analytical, ERM's NYSDOH ELAP certified laboratory for the air samples.

Section 4

SECTION 4.0

PROJECT SCHEDULE AND DELIVERABLES

The anticipated schedule for the DGI activities and deliverables is illustrated in Figure 4-1. This schedule is subject to change due to unforeseen events, including weather and/or delays in document review. The schedule will be updated monthly to show progress and will be submitted to the ANG with the scheduled monthly progress report deliverables.

The results of the DGI, and an evaluation of whether the objectives and goals set forth in this Work Plan were met, will be provided in a forthcoming Technical Memorandum.

Section 5

SECTION 5.0

REFERENCES

ANG. 2005. *Environmental Restoration Program Air National Guard Investigation Guidance*, July 2005.

EPA. 1996. *Low-flow (minimal drawdown) Groundwater Sampling* Procedures. United States Environmental Protection Agency Groundwater Issue, Office of Research and Development and Office of Solid Waste and Emergency Response, EPA/540/S-95/504, 12 pp.

ERM. 2008. *Final Site 15 Supplemental Remedial Investigation/Pilot Test Work Plan*, 174th Fighter Wing - New York Air National Guard- Hancock Air National Guard Base - Syracuse, New York - ERM, Dewitt, New York, October 2008.

ERM. 2010. *Final Technical Memorandum Supplemental Remedial Investigation/Pilot Test* - 174th Fighter Wing - New York Air National Guard- Hancock Air National Guard Base - Syracuse, New York - ERM, Dewitt, New York, March 2010.

Lockheed. 1997. *Final Remedial Investigation Report for Petroleum, Oil, and Lubricant Facility, Site 15.* Volumes I and II. Prepared by Lockheed Martin for the Air National Guard Readiness Center, Andrews AFB, Maryland. July 1997.

NYSDEC. 1998. *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.* NYSDEC Division of Water Technical and Operational Guidance Series Memorandum Number 1.1.1., June 1998 (latest amendment April 2000).

NYSDEC. 2010. DER-10, *Final Technical Guidance for Site Investigation and Remediation*, Division of Environmental Remediation, May 2010.

NYSDOH. 2003. *Study* of *Volatile Organic Chemicals in Air of Fuel Oil Heated Homes.*

NYSDOH. 2006. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006).

PARSONS 2004. *Remedial Action Plan For Hancock Air National Guard Site 15.* Parsons Engineering Science, Inc., Liverpool, New York, January 2004.

Figures

FIGURES

Project No. 0116255.1A
Date: 05/26/10
Drawn By: R. Olson
CAD File: G:\\0116255\1A\01162551A-01.dwg

Aerial Photo Source: © 2007 Google Earth Pro Ver 4.2.0205.5730

Figure 1-1
Site Location Map
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM *05/10*

CAD File: G:\\0116255\1A\01162551A-02.dwg

Drawn By: R. Olson

Date: 05/26/10

Project No. 0116255.1A

LEGEND

- 🟥 Site 15 IRAC Work Area
- ▬ Hancock Air National Guard Base Property Boundary
- - - - IRP Site 15

Aerial Photo Source: © 2007 Google Earth Pro Ver 4.2.0205.5730

Figure 1-2
IRP Site 15 Location Map
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM *05/10*

CAD File:	Drawn By:	Date:	Project No.
G:\\0116255\1A\01162551A-03.dwg	R. Olson	05/26/10	0116255.1A

Figure 1-3

Static Groundwater Contour Map

6 October 2009

174th Fighter Wing

Hancock Air National Guard

Syracuse, New York

ERM *05/10*

CAD File:	Drawn By:	Date:	Project No.
G:\\0116255\1A\01162551A-04.dwg	R. Olson	05/26/10	0116255.1A

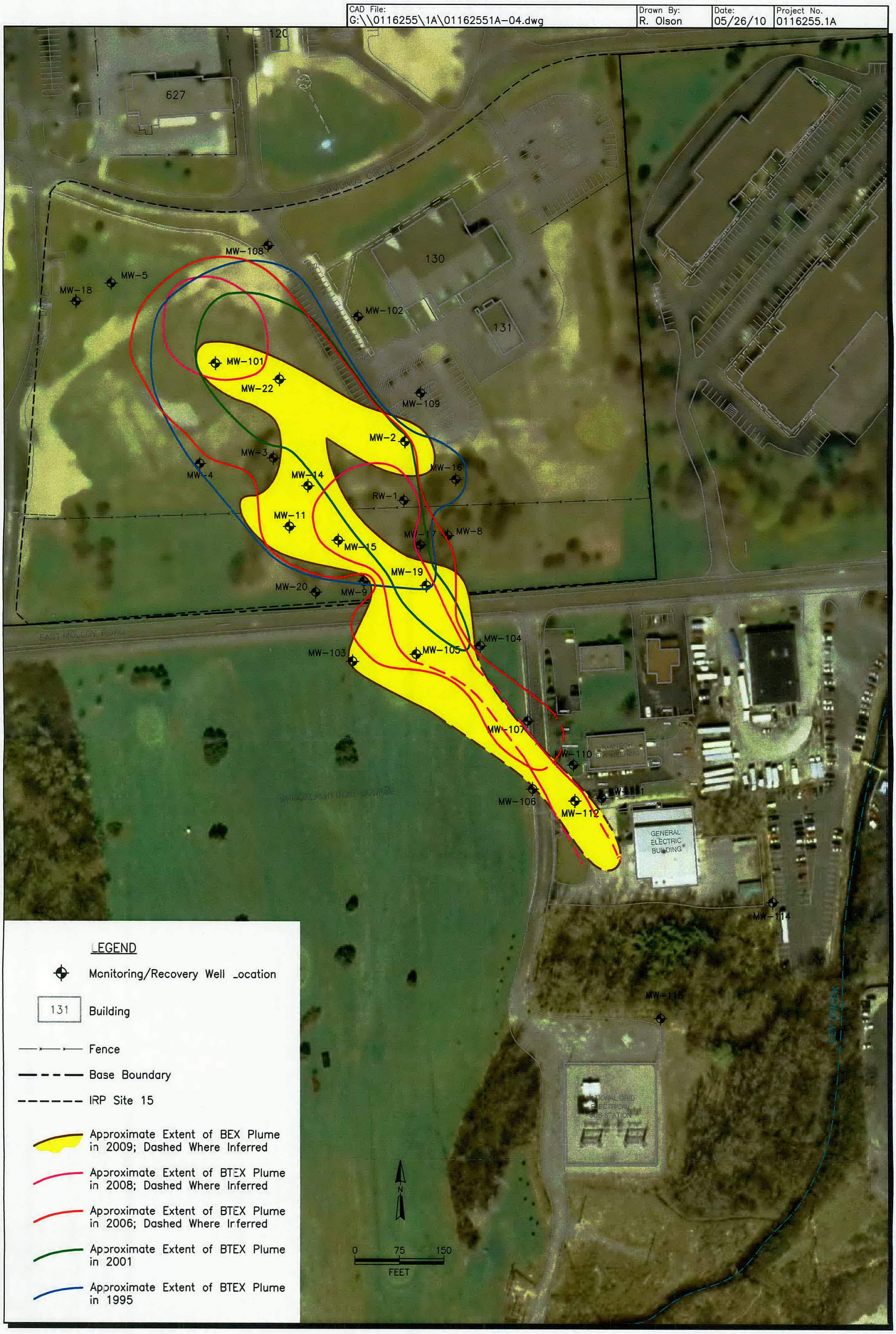


Figure 1-4

Estimated BTEX Extent

1995 to 2009

174th Fighter Wing

Hancock Air National Guard

Syracuse, New York

ERM 05/10

CAD File:	Drawn By:	Date:	Project No.
G:\\0116255\1A\01162551A-05.dwg	R. Olson	05/26/10	0116255.1A

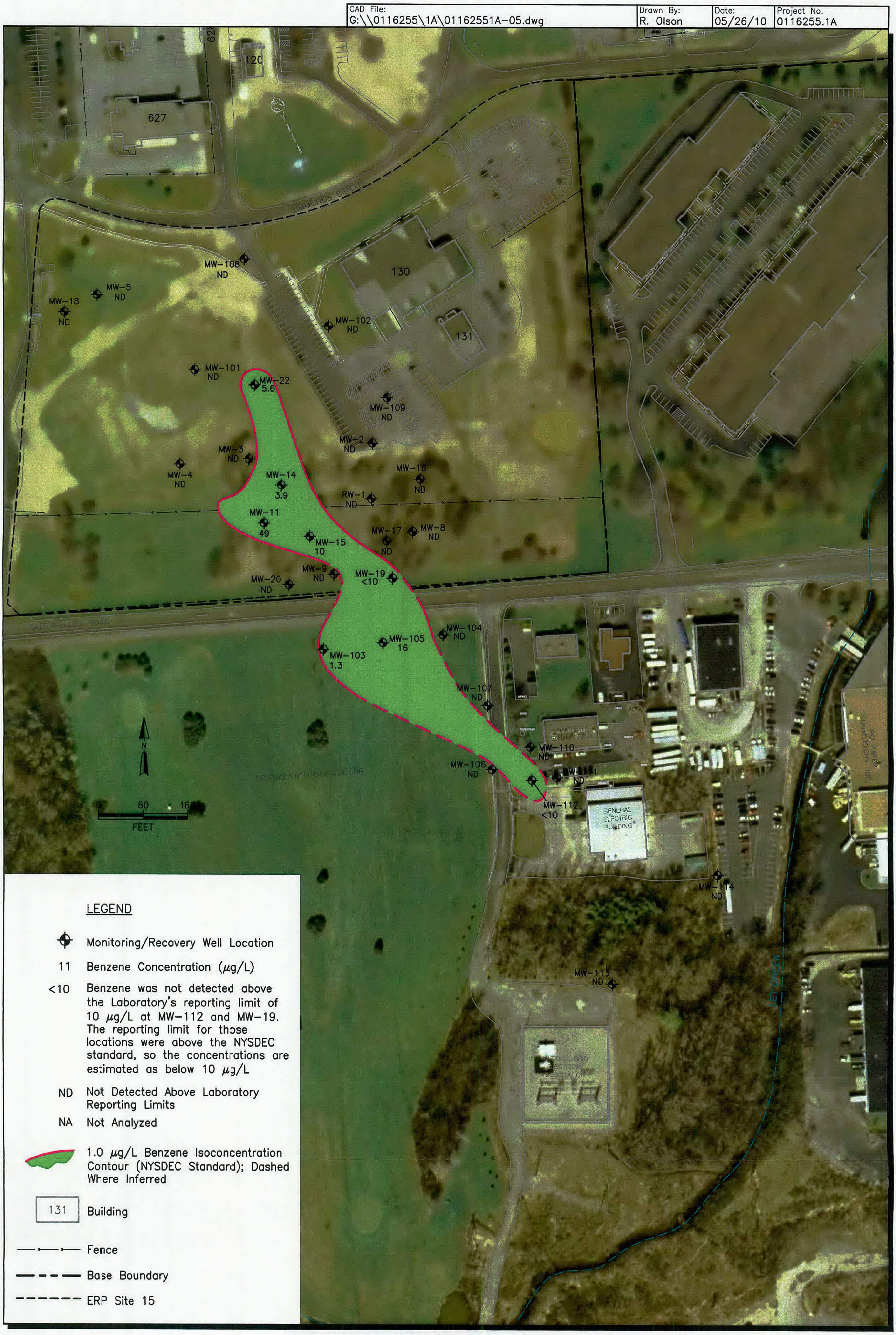


Figure 1-5

Groundwater Isoconcentration Map, Benzene
October 2009
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM *05/10*

CAD File:	Drawn By:	Date:	Project No.
G:\\0116255\1A\01162551A-06.dwg	R. Olson	05/26/10	0116255.1A

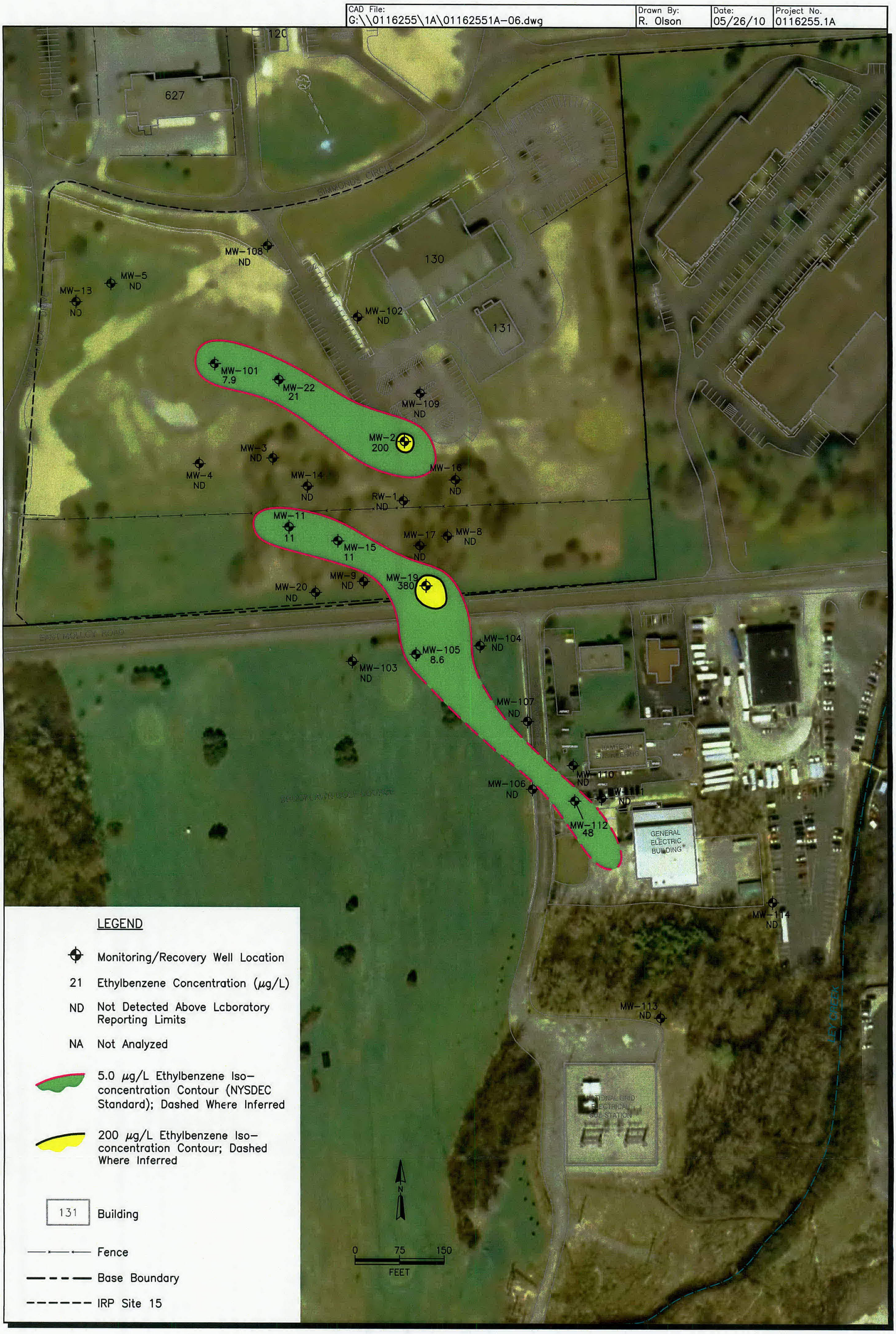


Figure 1-6

Groundwater Isoconcentration Map, Ethylbenzene
October 2009
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM *05/10*

CAD File:	Drawn By:	Date:	Project No.
G:\\0116255\1A\01162551A-07.dwg	R. Olson	05/26/10	0116255.1A

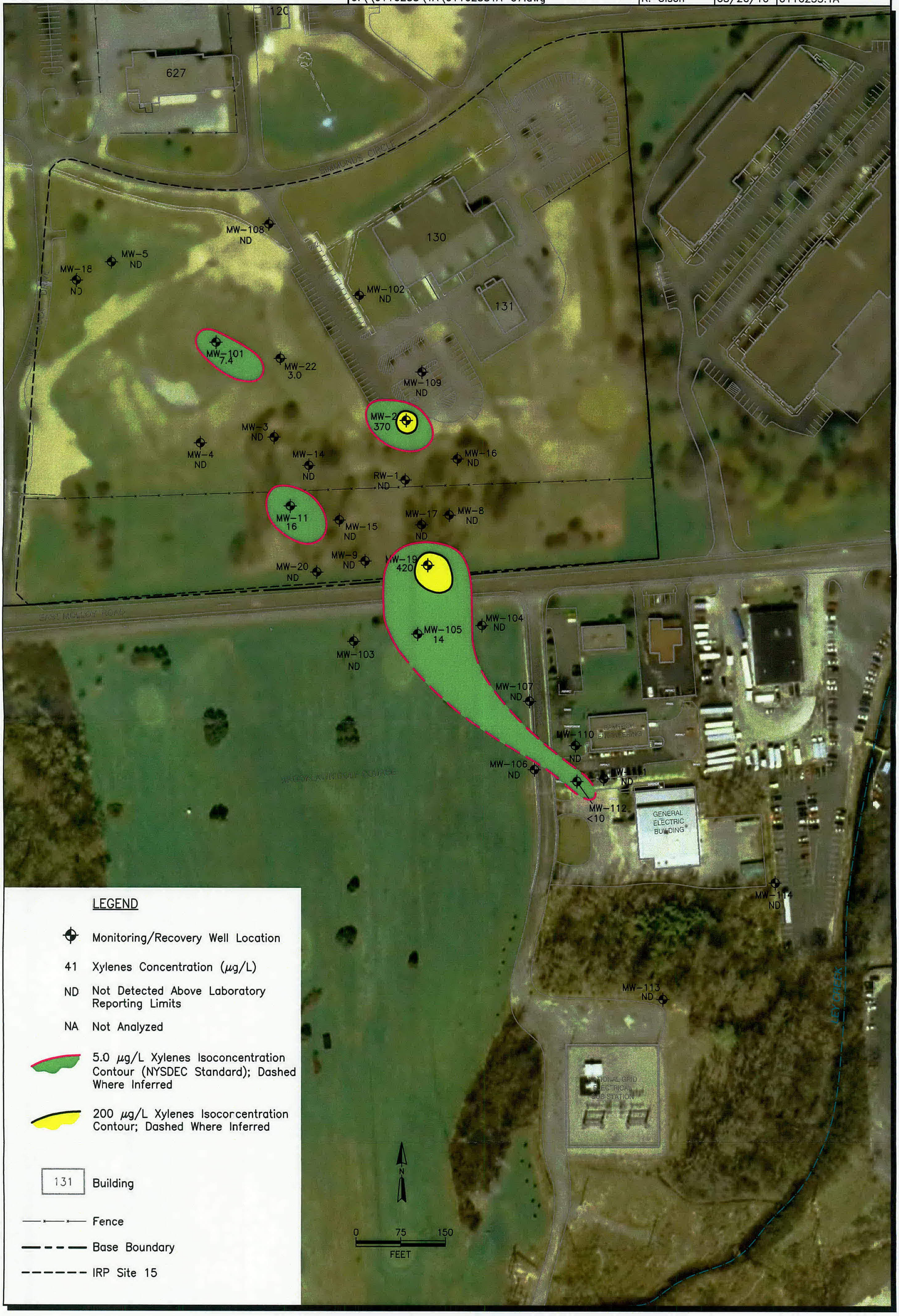


Figure 1-7

Groundwater Isoconcentration Map, Xylenes

October 2009

174th Fighter Wing

Hancock Air National Guard

Syracuse, New York

ERM *05/10*

CAD File: G:\\0116255\1A\01162551A-08.dwg	Drawn By: R. Olson	Date: 05/26/10	Project No. 0116255.1A

LEGEND

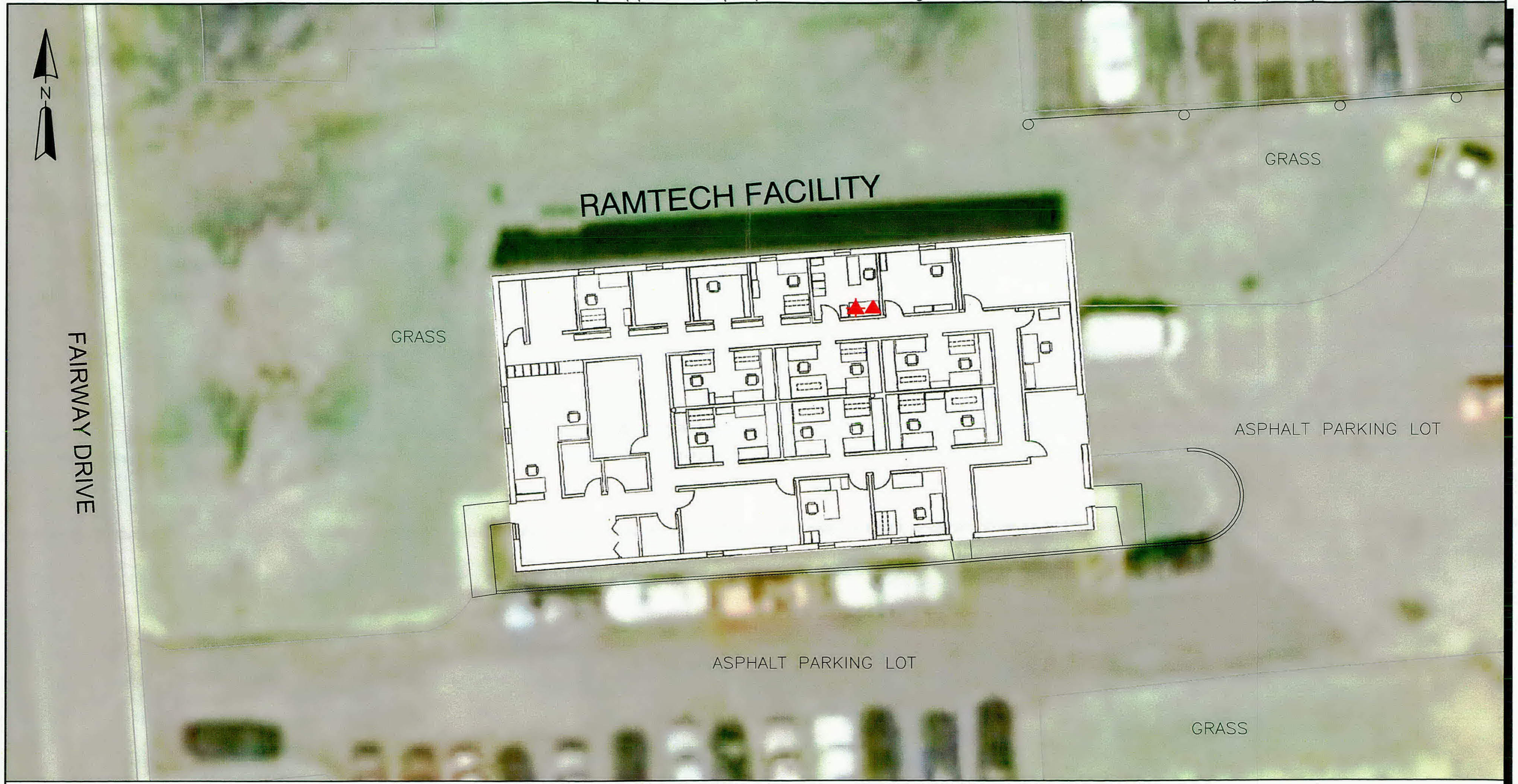
- ⚠ Soil Vapor Well Location (Summer 2009)
- Approximate GE Property Line
- Onondaga County Utility Easement
- Creek/Swale

Figure 1-8

2009 Soil Vapor Sample Locations
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM *05/10*

CAD File:	Drawn By:	Date:	Project No.
G:\\0116255\1A\01162551A-10.dwg	R. Olson	06/11/10	0116255.1A



LEGEND

▲ Indoor Air Sample Location

▲ Duplicate Sample Location

0 25
FEET

Aerial Photo Source: © 2007 Google
Earth Pro Ver 4.2.0205.5730

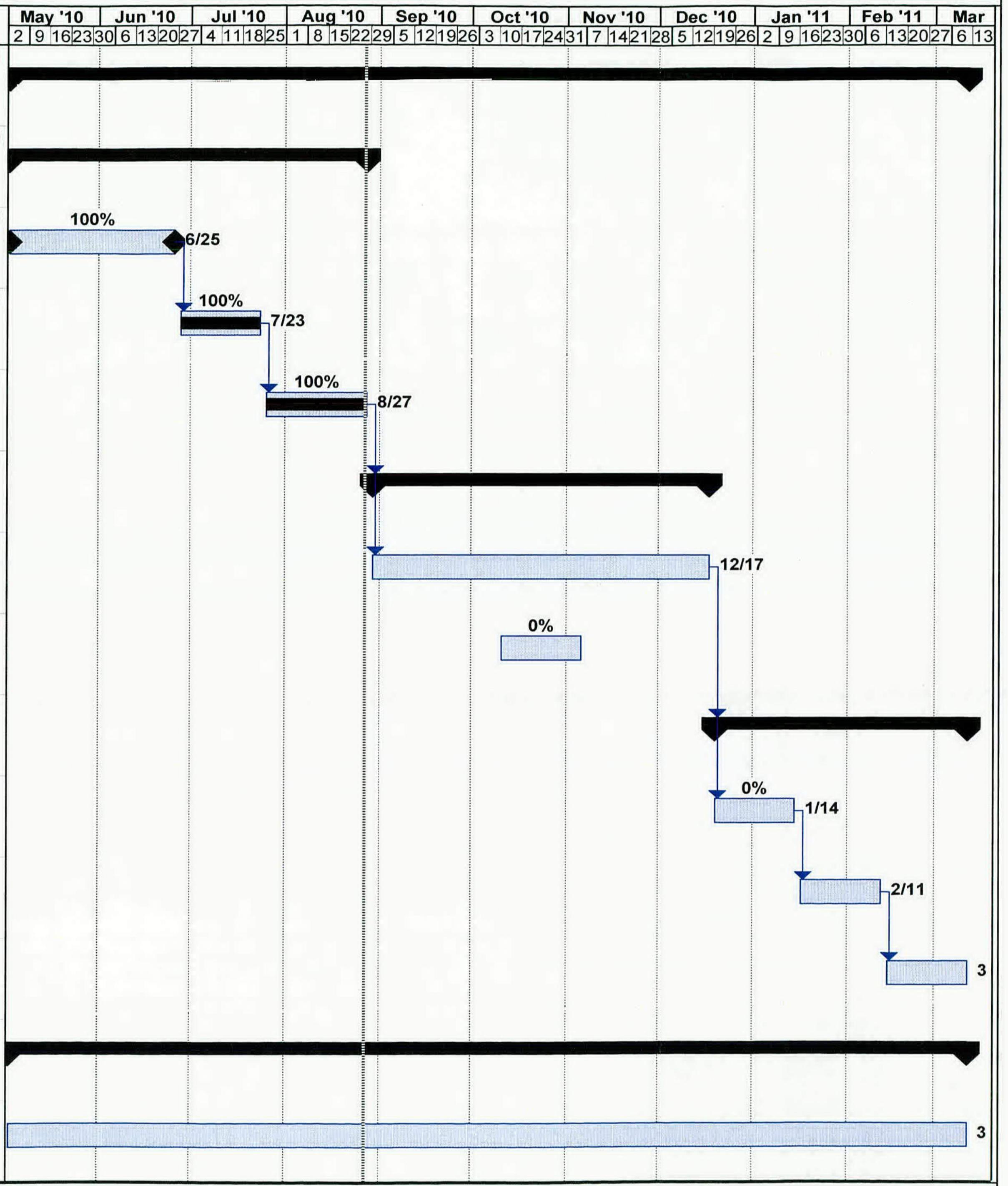
Figure 3-1

Proposed Indoor Air Sampling Locations
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM *06/10*

Hancock ANGB Site 15 Project Schedule
Data Gap Investigation - 2010
Contract DAHA92-01-D-0005, HAAW 20097054

ID	Task Name	Duration	Start	Finish
1	**Hancock ANG - Remedial Design Data Gap Investigation - Site 15 - 22 March 2010 Statement of Work**	**225 days**	**Mon 5/3/10**	**Fri 3/11/11**
2	**Task 1 - Work Plan Addendum**	**85 days**	**Mon 5/3/10**	**Fri 8/27/10**
3	Task 1A: Draft Work Plan Addendum	40 days	Mon 5/3/10	Fri 6/25/10
4	Task 1B: Draft Final Work Plan Addendum	20 days	Mon 6/28/10	Fri 7/23/10
5	Task 1C: Final Work Plan Addendum	25 days	Mon 7/26/10	Fri 8/27/10
6	**Task 2 - Field Work**	**80 days**	**Mon 8/30/10**	**Fri 12/17/10**
7	Task 2A - Indoor Air Evaluation	80 days	Mon 8/30/10	Fri 12/17/10
8	Task 2B - Groundwater Sampling and Analysis	20 days	Mon 10/11/10	Fri 11/5/10
9	**Task 3 - Technical Memorandum**	**60 days**	**Mon 12/20/10**	**Fri 3/11/11**
10	Task 3A - Draft Technical Memorandum	20 days	Mon 12/20/10	Fri 1/14/11
11	Task 3B - Draft Final Technical Memorandum	20 days	Mon 1/17/11	Fri 2/11/11
12	Task 3C- Final Technical Memorandum	20 days	Mon 2/14/11	Fri 3/11/11
13	**Task 4 - Quarterly Progress Reports (QPRs)**	**225 days**	**Mon 5/3/10**	**Fri 3/11/11**
14	Task 4A - QPRs	225 days	Mon 5/3/10	Fri 3/11/11



Project: EVEPH2_0298drft.MPP
Date: Fri 8/27/10

Task	▭	Rolled Up Task	▭	Project Summary	▬	Deadline	⇩
Progress	▬	Rolled Up Milestone	◇	Split	┈		
Milestone	◆	Rolled Up Progress	▬	Rolled Up Split	┈		
Summary	▬	External Tasks	▭	External Milestone	◆		

Tables

TABLE

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA - 2005 through 2009
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0086335

WELL ID	**MW-2**					**MW-3**					**MW-4**					**MW-5**					**NYSDEC STANDARD**
Sample Date	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	
VOCs (ug/l)																					
BENZENE	----	----	----	----	----	**200**	**57**	**75**	----	----	----	----	----	----	----	----	----	----	----	----	1
ETHYL BENZENE	3.5	**83**	**52**	----	**200**	**200**	**16**	**61**	----	----	----	----	----	----	----	----	----	----	----	----	5
TOLUENE	----	----	----	----	NA	----	----	0.34J	----	NA	----	----	----	----	NA	----	----	----	----	NA	5
XYLENE	2	**98**	**44**	----	**370**	**95**	**15**	**28**	----	----	----	----	----	----	----	----	----	----	----	----	5
MTBE	----	----	----	----	NA	----	----	----	----	NA	----	----	----	----	NA	----	----	----	----	NA	10
NATURAL ATTENUATION PARAMETERS (mg/l)																					
NITRATE	0.55	----	0.17	0.86	< 0.1	0.21	----	----	0.33	< 0.1	0.13	0.41	----	0.18	0.21	1.20	0.98	0.28	1.3	< 0.1	NA
SULFATE	67.0	7.5	37	98	2.8	2.8	2.4	4	6.0	9.3	26.0	26.0	8.9	3.7	37.0	12.0	15.0	11	8.0	8.6	NA
ALKALINITY	300	310	380	190	400	270	350	300	120	360	190	250	240	40	290	220	260	340	140	280	NA
TOTAL HARDNESS	740	310	350	820	590	380	310	230	57	500	240	250	180	37	350	280	260	270	180	310	NA
AMMONIA	----	0.088	UJ	0.046	0.20	----	0.76	0.065J	----	0.75	----	0.18	----	----	0.11	----	----	UJ	----	<0.03	NA
METHANE	----	8.800	----	0.0076	4.4	0.100	1.600	----	----	0.28	0.011	0.011	----	----	0.012	----	----	----	----	0.02	NA
PARAMETERS MEASURED IN THE FIELD																					
FERROUS IRON	----	3.8	0.9	0.8	4.2	6.1	3.3	2.2	0	2.1	----	1.200	0	0	1	----	0.300	0	0	1.7	NA
pH	7.06	6.95	8.26	6.96	7.54	6.92	6.45	6.77	6.3	6.33	7.30	6.88	8.26	7.16	7.43	7.12	8.21	6.68	7.04	7.14	NA
DISSOLVED OXYGEN	0.00	0.00	0.29	2.28	0.18	0.00	0.00	2.79	7.99	0.12	1.15	0.00	0	0.64	0.49	4.80	0.00	0.77	7.70	0.00	NA
OXIDATION REDUCTION POTENTIAL	76	-127	-76	123.9	44.4	-61	-81	-8	146.6	-71	43	-113	-46	186.9	44	146	-50	121	41.6	-109	NA
CONDUCTIVITY	1.120	0.999	1.4	6.794	1.471	0.531	0.811	0.76	0.106	0.822	0.366	0.803	0.391	0.067	0.440	0.391	0.362	0.577	0.377	0.595	NA
FIELD OBSERVATIONS	----	----	----	----	---	Odor	Odor	Odor	----	---	----	----	----	----	---	----	----	----	----	---	----

NOTES:

ug/L = Micrograms per liter

VOCs - volatile organic compounds determined by USEPA Method 8260

NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998

The MTBE ground water standard is from NYSDEC's TAGM 8086

- Bold white type with black background indicates exceedance of the NYSDEC Standards or Guidance Value

J = Results greater than the reporting limit that are considered estimated.

UJ= Results less than the reporting limit that are considered estimated.

---- = the compound was not detected at a concentration above the laboratory reporting limit

Natural Attenuation Parameters are used to characterize the physical, chemical and biological response of a hydrologic system to contamination.

Dissolved Oxygen, Oxidation Reduction Potential, pH and conductivity were measured in the field using a Horiba U-22 and flow through cell just prior to collecting samples.

Ferrous Iron concentration were measured using a HACH Test Kit

Ferrous Iron and DO are reported in mg/L

pH is reported in standard units

Oxidation Reduction Potential is reported in mV

Conductivity is reported in ms/cm

Odor = "Petroleum-like" odor

mg/L= Milligrams per liter

Sheen= Sheen on purge water and/or sample

TABLE 1 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA - 2005 through 2009
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0086335

WELL ID	**MW-8**					**MW-9**					**MW-11**					**MW-14**					**NYSDEC**
Sample Date	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**STANDARDS**
VOCs (ug/l)																					
BENZENE	----	----	----	----	----	----	----	----	----	----	**32**	**31**	**17**	----	**49**	**3.7**	**4.5**	**2**	----	**3.9**	1
ETHYL BENZENE	**6.4**	----	----	----	----	----	----	----	----	----	----	1.4	0.63J	----	**11**	----	1.2	0.22J	----	----	5
TOLUENE	----	----	----	----	NA	----	----	----	----	NA	----	----	0.11J	----	NA	----	----	----	----	NA	5
XYLENE	4	----	----	----	----	----	----	----	----	----	----	**5.2**	0.36J	----	**16**	----	----	----	----	----	5
MTBE	----	----	----	----	NA	----	----	----	----	NA	----	2.2	----	----	NA	----	1.9	----	----	NA	10
NATURAL ATTENUATION PARAMETERS (mg/l)																					
NITRATE	0.20	----	----	1.2	< 0.1	0.16	0.37	0.1	0.91	< 0.1	0.23	0.15	----	0.34	<0.1	0.77	----	----	0.26	<0.1	NA
SULFATE	24.0	28.0	42	8.7	52.0	38.0	21.0	20	6.1	12.0	8.8	22.0	22	72	4.5	24.0	43.0	45	66.0	45.0	NA
ALKALINITY	320	320	250	88	400	110	200	270	32	260	330	330	260	370	360	230	320	370	350	340	NA
TOTAL HARDNESS	380	120	370	96	650	130	360	83	26	220	320	320	370	440	510	230	350	380	400	470	NA
AMMONIA	----	----	UJ	----	< 0.03	----	0.25	0.12J	0.14	0.37	----	----	0.042J	----	<0.03	----	----	0.2	----	<0.03	NA
METHANE	0.730	0.015	----	0.0024	0.011	----	0.020	----	----	----	0.006	0.740	----	0.052	1.6	1.800	0.130	0.039	0.14	0.16	NA
PARAMETERS MEASURED IN THE FIELD																					
FERROUS IRON	2.0	2.4	1	0.8	1.2	0.1	2.0	1.05	1.1	2.0	4.0	4.4	1.6	2.5	2.2	0.5	2.8	NM	1.4	2.0	NA
pH	6.94	7.12	4.58	6.29	7.70	6.27	6.51	6.41	6.64	8.31	7.38	7.19	4.51	7.29	7.00	6.96	7.07	7.33	7.13	7.68	NA
DISSOLVED OXYGEN	0.00	0.00	10.9	6.21	0.35	0.00	0.00	0	10.09	3.02	0.00	0.00	11.36	0.23	0.00	2.12	0.00	0	0.20	0.15	NA
OXIDATION REDUCTION POTENTIAL	-28	-126	271	41	12.8	152	-26	0.43	109.9	-144.7	-271	-155	270	-93.1	-163	-14	-137	-121	-50.2	14.7	NA
CONDUCTIVITY	0.706	0.999	0	0.172	0.873	1.270	0.969	0.83	0.137	1.006	0.643	0.97	0	1.056	1.280	0.496	0.9	0.91	0.567	0.467	NA
FIELD OBSERVATIONS	----	----	----	----	----	Odor	Odor	----	----	----	Odor	Odor	----	----	Odor	Odor	Odor	Odor	Dye Visible	Dye Visible	----

NOTES:

ug/L = Micrograms per liter

VOCs - volatile organic compounds determined by USEPA Method 8260

NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998

The MTBE ground water standard is from NYSDEC's TAGM 8086

- Bold white type with black background indicates exceedance of the NYSDEC Standards or Guidance Value

J = Results greater than the reporting limit that are considered estimated.

UJ= Results less than the reporting limit that are considered estimated.

---- = the compound was not detected at a concentration above the laboratory reporting limit

Natural Attenuation Parameters are used to characterize the physical, chemical and biological response of a hydrologic system to contamination.

Dissolved Oxygen, Oxidation Reduction Potential, pH and conductivity were measured in the field using a Horiba U-22 and flow through cell just prior to collecting samples.

Ferrous Iron concentration were measured using a HACH Test Kit

Ferrous Iron and DO are reported in mg/L

pH is reported in standard units

Oxidation Reduction Potential is reported in mV

Conductivity is reported in ms/cm

Odor = "Petroleum-like" odor

mg/L= Milligrams per liter

Sheen= Sheen on purge water and/or sample

TABLE 1 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA - 2005 through 2009
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0086335

WELL ID	**MW-15**					**MW-16**					**MW-17**					**MW-18**					**NYSDEC**
Sample Date	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**STANDARDS**
VOCs (ug/l)																					
BENZENE	**100**	**140**	**66**	**6.8**	**10**	----	----	----	----	----	----	----	0.18J	----	----	----	----	----	----	----	1
ETHYL BENZENE	**28**	**33**	**38**	----	**11**	----	----	0.25J	----	----	----	2	**49**	----	----	----	----	----	----	----	5
TOLUENE	----	----	----	----	NA	----	----	0.38J	----	NA	----	----	----	----	NA	----	----	----	----	NA	5
XYLENE	3	----	----	----	----	----	----	----	----	----	----	----	**31**	----	----	----	----	----	----	----	5
MTBE	----	2.8	----	----	NA	----	----	----	----	NA	----	----	----	----	NA	----	----	----	----	NA	10
NATURAL ATTENUATION PARAMETERS (mg/l)																					
NITRATE	0.21	----	----	0.8	<0.1	0.20	----	0.11	0.48	<0.1	3.20	0.13	----	3.3	<0.1	1.40	0.34	0.83	0.52	<0.1	NA
SULFATE	37.0	17.0	27	28	31	62.0	37.0	99	63	63	58.0	16.0	41	27	19	13.0	12.0	13	6.0	14.0	NA
ALKALINITY	380	340	290	410	340	260	350	520	400	370	260.0	360.0	320	260	370	290	310	320	92	390	NA
TOTAL HARDNESS	430	370	380	460	420	450	390	480	530	550	300	370	370	260	540	300	280	300	99	430	NA
AMMONIA	----	----	0.11J	0.041	<0.03	----	----	5.1J	----	<0.03	1.50	1.20	0.13J	----	0.22	----	----	UJ	----	<0.03	NA
METHANE	2.100	1.400	----	0.93	0.19	----	0.057	0.0078	----	0.0089	0.033	1.400	----	----	1.1	----	----	----	----	0.0029	NA
PARAMETERS MEASURED IN THE FIELD																					
FERROUS IRON	4.6	3.1	2.95	2.2	2.4	----	0.400	NM	0.2	0.2	----	2.200	3.2	0	1.4	----	0.000	0	0	0	NA
pH	7.00	6.88	7.2	7.16	7.55	7.17	6.99	7.15	6.67	7.60	7.35	6.83	7.01	6.75	6.69	7.25	8.10	7.13	7.07	7.49	NA
DISSOLVED OXYGEN	0.00	0.00	0	0.31	0.13	1.70	0.00	0	1.30	0.42	0.00	0.00	0	6.29	0.00	0.20	0.00	0	1.06	1.11	NA
OXIDATION REDUCTION POTENTIAL	-67	150	-153	-99.1	7.8	-85	-16	-19	153.8	18.9	-308	-139	-98	53.9	-115	-202	127	185	181.1	44.5	NA
CONDUCTIVITY	1.170	1.01	0.99	0.630	525	1.050	0.97	3.06	1.052	0.891	0.623	0.6	0.9	0.522	1.260	0.486	0.378	0.986	0.143	0.568	NA
FIELD OBSERVATIONS	----	----	Odor	----	Odor	----	----	----	Dye Visible	Dye Visible	----	----	----	----	----	----	----	----	----	----	----

NOTES:

ug/L = Micrograms per liter

VOCs - volatile organic compounds determined by USEPA Method 8260

NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998

The MTBE ground water standard is from NYSDEC's TAGM 8086

- Bold white type with black background indicates exceedance of the NYSDEC Standards or Guidance Value

J = Results greater than the reporting limit that are considered estimated.

UJ= Results less than the reporting limit that are considered estimated.

---- = the compound was not detected at a concentration above the laboratory reporting limit

Natural Attenuation Parameters are used to characterize the physical, chemical and biological response of a hydrologic system to contamination.

Dissolved Oxygen, Oxidation Reduction Potential, pH and conductivity were measured in the field using a Horiba U-22 and flow through cell just prior to collecting samples.

Ferrous Iron concentration were measured using a HACH Test Kit

Ferrous Iron and DO are reported in mg/L

pH is reported in standard units

Oxidation Reduction Potential is reported in mV

Conductivity is reported in ms/cm

Odor = "Petroleum-like" odor

mg/L= Milligrams per liter

Sheen= Sheen on purge water and/or sample

TABLE 1 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA - 2005 through 2009
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0086335

WELL ID	**MW-19**							**MW-20**					**MW-22**					**NYSDEC**
Sample Date	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Apr-09**	**Aug-09**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**STANDARDS**
VOCs (ug/l)																		
BENZENE	**28**	**33**	**17J**	----	0.71 J	**6**	**< 10**	----	----	----	----	----	**110**	**70**	**51**	----	**5.6**	1
ETHYL BENZENE	**300**	**610**	**270**	**8.5**	**17**	**410**	**380**	----	----	----	----	----	**89**	**32**	**82**	----	**21**	5
TOLUENE	----	----	----	----	NA	NA	NA	----	----	----	----	NA	----	----	0.34J	----	NA	5
XYLENE	**650**	**860**	**460**	**9**	**20**	**760**	**420**	----	----	----	----	----	**88**	**46**	**90**	----	3	5
MTBE	----	----	----	----	NA	NA	NA	----	----	----	----	NA	----	----	----	----	NA	10
NATURAL ATTENUATION PARAMETERS (mg/l)																		
NITRATE	0.19	----	----	0.28	----	----	<0.1	0.45	----	----	1.4	<0.1	1.50	----	0.3	1.9	<0.1	NA
SULFATE	15.0	----	11	25.0	20.0	6.7	4.9	36.0	15.0	240	11.0	9.4	32.0	8.8	41	16.0	31.0	NA
ALKALINITY	350	330	240	410	330	330	340	340	340	370	67	350	330	400	370	170	410	NA
TOTAL HARDNESS	340	350	330	350	400	560	550	420	330	300	83	330	390	340	340	160	570	NA
AMMONIA	----	----	0.75J	----	----	0.077	0.16	----	----	0.03J	----	< 0.03	----	0.12	0.1	----	<0.03	NA
METHANE	3.400	3.500	----	0.99	0.61	0.98	3	0.018	0.027	----	----	0.13	2.300	1.800	1.3	0.017	1.0	NA
PARAMETERS MEASURED IN THE FIELD																		
FERROUS IRON	----	4.100	2.2	2	1.7	2.7	1.9	----	2.500	1.2	0	1.8	----	5.300	NM	0	0.8	NA
pH	6.78	6.68	4.66	6.37	7.1	6.64	8.21	7.06	6.71	4.69	6.47	7.48	6.87	7.81	5.19	6.57	6.85	NA
DISSOLVED OXYGEN	0.00	0.00	10.95	0.88	0.71	0.29	0.21	0.00	0.00	11.17	0.26	0.23	5.70	0.00	9.55	0.16	0.00	NA
OXIDATION REDUCTION POTENTIAL	-79	-101	267	23.7	11.6	-33.4	-132.6	-390	-76	261	207.5	-50.1	-242	-92	226	174.9	-25	NA
CONDUCTIVITY	1.210	0.91	0	1.260	0.997	1.052	1.450	0.839	0.954	0	0.143	0.807	0.607	1.07	0	0.155	1.410	NA
FIELD OBSERVATIONS	----	----	----	----	----	Odor	----	----	----	----	----	----	Odor	Odor	----	Odor	----	----

NOTES:

ug/L = Micrograms per liter

VOCs - volatile organic compounds determined by USEPA Method 8260

NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998

The MTBE ground water standard is from NYSDEC's TAGM 8086

- Bold white type with black background indicates exceedance of the NYSDEC Standards or Guidance Value

J = Results greater than the reporting limit that are considered estimated.

UJ= Results less than the reporting limit that are considered estimated.

---- = the compound was not detected at a concentration above the laboratory reporting limit

Natural Attenuation Parameters are used to characterize the physical, chemical and biological response of a hydrologic system to contamination.

Dissolved Oxygen, Oxidation Reduction Potential, pH and conductivity were measured in the field using a Horiba U-22 and flow through cell just prior to collecting samples.

Ferrous Iron concentration were measured using a HACH Test Kit

Ferrous Iron and DO are reported in mg/L

pH is reported in standard units

Oxidation Reduction Potential is reported in mV

Conductivity is reported in ms/cm

Odor = "Petroleum-like" odor

mg/L= Milligrams per liter

Sheen= Sheen on purge water and/or sample

TABLE 1 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA - 2005 through 2009
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0086335

WELL ID	**RW-1**					**MW-101**			**MW-102**			**MW-103**			**MW-104**			**NYSDEC**
Sample Date	**Apr-05**	**Sep-05**	**Nov-06**	**Feb-08**	**Oct-09**	**Nov-06**	**Feb-08**	**Oct-09**	**Nov-06**	**Feb-08**	**Oct-09**	**Nov-06**	**Feb-08**	**Oct-09**	**Nov-06**	**Feb-08**	**Oct-09**	**STANDARDS**
VOCs (ug/l)																		
BENZENE	----	**2.4**	**1.4J**	----	----	**8.9**	----	----	----	----	----	----	----	**1.3**	----	----	----	1
ETHYL BENZENE	**11.0**	**18**	**60**	**45**	----	**110**	**22**	**7.9**	----	----	----	----	----	----	----	----	----	5
TOLUENE	----	----	0.4J	----	NA	----	----	NA	----	----	NA	----	----	NA	----	----	NA	5
XYLENE	**21.0**	**36.0**	**30**	**60**	----	**230**	**41**	**7.4**	----	----	----	----	----	----	----	----	----	5
MTBE	----	----	----	----	NA	----	----	NA	----	----	NA	----	----	NA	----	----	NA	10
NATURAL ATTENUATION PARAMETERS (mg/l)																		
NITRATE	0.12	----	----	0.18	<0.1	0.72	0.47	<0.1	0.13	0.42	<0.1	0.34	0.32	<0.1	0.38	0.3	<0.1	NA
SULFATE	13.0	19.0	170	6.7	5	44	35	42	50	52	5	27	36	33	39	4.5	41	NA
ALKALINITY	200	310	310	250	310	380	300	360	410	390	340	250	340	330	330	54	370	NA
TOTAL HARDNESS	240.0	310.0	380	280	430	430	420	490	550	520	640	310	360	510	440	22	500	NA
AMMONIA	0.45	0.34	1.1	0.44	0.82	0.12	----	<0.03	UJ	----	<0.03	----	----	<0.03	0.13	0.34	<0.03	NA
METHANE	1.300	1.300	6.3	4.4	1.3	0.63	0.55	0.44	0.026	0.016	0.0084	0.27	0.90	0.0970	0.055	----	0.033	NA
PARAMETERS MEASURED IN THE FIELD																		
FERROUS IRON	1.0	3.2	NM	1.3	2.5	2.8	1.6	1.2	0.6	0.4	1.8	1.2	0.9	2.9	0.2	0.0	2.1	NA
pH	7.11	7.01	6.8	6.90	6.83	5.15	7.82	6.98	4.89	6.93	7.40	4.65	7.12	6.82	7.27	6.99	7.55	NA
DISSOLVED OXYGEN	0.00	0.00	0	0.13	0.00	9.84	0.50	0.00	9.9	0.72	0.16	10.92	0.33	0.00	0	12.38	0.28	NA
OXIDATION REDUCTION POTENTIAL	-129	-166	-200	-248.8	-156	238	-35.2	-103	267	46.3	46.8	275	-48.9	-132	-51	112.3	-70.5	NA
CONDUCTIVITY	0.605	0.999	12.1	0.666	1.100	0	0.731	1.280	0	1.459	1.532	0	1.776	1.420	1.49	0.034	1.674	NA
FIELD OBSERVATIONS	Odor/ Sheen	Odor	Odor	Odor/sheen	ye Visible/ Oc	Odor/sheen	----	----	----	----	----	----	----	----	----	----	----	----

NOTES:

ug/L = Micrograms per liter

VOCs - volatile organic compounds determined by USEPA Method 8260

NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998

The MTBE ground water standard is from NYSDEC's TAGM 8086

- Bold white type with black background indicates exceedance of the NYSDEC Standards or Guidance Value

J = Results greater than the reporting limit that are considered estimated.

UJ= Results less than the reporting limit that are considered estimated.

---- = the compound was not detected at a concentration above the laboratory reporting limit

Natural Attenuation Parameters are used to characterize the physical, chemical and biological response of a hydrologic system to contamination.

Dissolved Oxygen, Oxidation Reduction Potential, pH and conductivity were measured in the field using a Horiba U-22 and flow through cell just prior to collecting samples.

Ferrous Iron concentration were measured using a HACH Test Kit

Ferrous Iron and DO are reported in mg/L

pH is reported in standard units

Oxidation Reduction Potential is reported in mV

Conductivity is reported in ms/cm

Odor = "Petroleum-like" odor

mg/L= Milligrams per liter

Sheen= Sheen on purge water and/or sample

TABLE 1 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA - 2005 through 2009
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0086335

WELL ID	**MW-105**					**MW-106**					**MW-107**					**NYSDEC**
Sample Date	**Nov-06**	**Feb-08**	**Apr-09**	**Aug-09**	**Oct-09**	**Nov-06**	**Feb-08**	**Apr-09**	**Aug-09**	**Oct-09**	**Nov-06**	**Feb-08**	**Apr-09**	**Aug-09**	**Oct-09**	**STANDARDS**
VOCs (ug/l)																
BENZENE	**110**	**86**	**6.2**	**3.3**	**16**	----	----	----	----	----	0.52J	----	----	----	----	1
ETHYL BENZENE	**300**	**260**	**120**	----	**8.6**	----	----	----	----	----	**30**	----	----	----	----	5
TOLUENE	----	----	NA	NA	NA	----	----	NA	NA	NA	----	----	NA	NA	NA	5
XYLENE	**480**	**430**	**260**	----	**14**	----	----	----	----	----	0.41J	----	0.27 J	----	----	5
MTBE	----	----	NA	NA	NA	0.34J	----	NA	NA	NA	----	----	NA	NA	NA	10
NATURAL ATTENUATION PARAMETERS (mg/l)																
NITRATE	0.11	0.29	0.21	----	<0.1	----	0.12	----	----	<0.1	1.1	2.6	2.1	0.41	0.54	NA
SULFATE	6.3	5.6	8.1	25	14	28	42	49	48	36	17	12	15	45	42	NA
ALKALINITY	270	420	380	320	360	420	340	390	340	340	290	100	200	190	180	NA
TOTAL HARDNESS	370	320	370	370	460	430	410	450	550	380	360	120	200	510	330	NA
AMMONIA	0.054	----	----	----	<0.03	UJ	----	----	----	<0.03	0.099	----	---	---	<0.03	NA
METHANE	3.3	7.8	2.8	1.5	0.51	0.14	0.07	0.051	0.28	0.045	0.29	----	0.0049	0.033	0.057	NA
PARAMETERS MEASURED IN THE FIELD																
FERROUS IRON	2.2	1.1	3.5	0.8	2.9	0	0.0	0.8	0.0	0.0	1.6	0.0	0.0	5.2	3.5	NA
pH	4.64	6.97	7.39	7.21	7.77	7.32	7.35	6.97	7.53	7.38	5	6.88	6.92	7.62	7.49	NA
DISSOLVED OXYGEN	11.09	0.38	0.29	2.95	0.38	0	0.19	0.23	0.26	0.14	10.45	7.57	4.89	2.57	2.24	NA
OXIDATION REDUCTION POTENTIAL	272	-66.1	-43.1	86.1	-107.1	-20	-58.7	-5.3	10.1	-6.0	255	99.8	21.4	-21.7	-17.7	NA
CONDUCTIVITY	0	0.567	817	0.956	1.128	1.66	0.558	1.404	0.850	0.854	0	0.490	0.845	0.915	1.238	NA
FIELD OBSERVATIONS	Odor/sheen	Odor	Odor	)xidant in H2(	----	----	----	----	----	----	----	----	----	----	----	----

NOTES:

ug/L = Micrograms per liter

VOCs - volatile organic compounds determined by USEPA Method 8260

NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998

The MTBE ground water standard is from NYSDEC's TAGM 8086

- Bold white type with black background indicates exceedance of the NYSDEC Standards or Guidance Value

J = Results greater than the reporting limit that are considered estimated.

UJ= Results less than the reporting limit that are considered estimated.

---- = the compound was not detected at a concentration above the laboratory reporting limit

Natural Attenuation Parameters are used to characterize the physical, chemical and biological response of a hydrologic system to contamination.

Dissolved Oxygen, Oxidation Reduction Potential, pH and conductivity were measured in the field using a Horiba U-22 and flow through cell just prior to collecting samples.

Ferrous Iron concentration were measured using a HACH Test Kit

Ferrous Iron and DO are reported in mg/L

pH is reported in standard units

Oxidation Reduction Potential is reported in mV

Conductivity is reported in ms/cm

Odor = "Petroleum-like" odor

mg/L= Milligrams per liter

Sheen= Sheen on purge water and/or sample

TABLE 1 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA - 2005 through 2009
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0086335

WELL ID	**MW-108**		**MW-109**		**MW-110**		**MW-111**				**MW-112**				**MW-113**		**MW-114**		**NYSDEC**
Sample Date	**Feb-08**	**Oct-09**	**Feb-08**	**Oct-09**	**Feb-08**	**Oct-09**	**Feb-08**	**Apr-09**	**Aug-09**	**Oct-09**	**Feb-08**	**Apr-09**	**Aug-09**	**Oct-09**	**Feb-08**	**Oct-09**	**Feb-08**	**Oct-09**	**STANDARDS**
VOCs (ug/l)																			
BENZENE	----	----	----	----	----	----	----	----	----	----	----	**13**	**6.9**	**< 10**	----	----	----	----	1
ETHYL BENZENE	----	----	----	----	----	----	----	----	----	----	**410**	**250**	**300**	**48**	----	----	----	----	5
TOLUENE	----	NA	----	NA	----	NA	----	NA	NA	NA	----	NA	NA	NA	NA	NA	NA	NA	5
XYLENE	----	----	----	----	----	----	----	----	----	----	**740**	**480**	**170**	**<20**	----	----	----	----	5
MTBE	----	NA		NA	----	NA	----	NA	NA	NA	----	NA	NA	NA	NA	NA	NA	NA	10
NATURAL ATTENUATION PARAMETERS (mg/l)																			
NITRATE	0.39	<0.1	0.66	<0.1	----	<0.1	----	----	----	<0.1	----	----	----	1.4	----	<0.1	----	<0.1	NA
SULFATE	41	44	70	65	41	57	65	45	48	49	19	11	11	8.4	11	62	11	56	NA
ALKALINITY	400	380	410	340	370	380	350	360	330	360	370	360	330	340	330	470	330	350	NA
TOTAL HARDNESS	510	540	460	420	450	570	410	490	600	540	380	570	530	510	530	540	530	400	NA
AMMONIA	< 0.03	< 0.03	< 0.03	< 0.03	----	< 0.03	----	----	----	< 0.03	----	----	----	0.051	----	< 0.03	----	< 0.03	NA
METHANE	0.018	0.0082	0.28	0.0078	0.048	0.061	0.044	0.040	0.051	0.039	7.2	3	1.6	1.4	1.6	0.021	1.6	0.0044	NA
PARAMETERS MEASURED IN THE FIELD																			
FERROUS IRON	1.6	1.2	0.0	0.2	0.4	0.0	0.0	0.0	0.2	0.0	1.3	2.1	2.2	0.0	1.7	1.5	1.8	1.4	NA
pH	6.92	6.93	6.95	7.49	7.14	7.54	7.23	7.34	7.24	7.21	7.25	8.30	6.57	7.33	7.06	7.19	6.90	7.12	NA
DISSOLVED OXYGEN	0.39	0	0.04	0.68	0.11	0.17	0.10	0.28	0.33	0.15	0.42	0.16	0.37	0.26	0.30	0.00	0.14	0.00	NA
OXIDATION REDUCTION POTENTIAL	27.6	-61	162.5	59.1	0.4	30.7	14.7	22.3	28.8	27.9	-110.2	-74.6	-71.3	21.5	-57.8	-42.7	-43.3	-112	NA
CONDUCTIVITY	1.033	2.16	1.269	1	0.970	1.311	0.725	0.848	1.199	1.750	0.599	0.855	15.890	1.481	1.349	1.863	1.055	1.38	NA
FIELD OBSERVATIONS	----		----	----	----	----	----	----	----	----	Odor	Odor	Odor	Odor	----	----	artesian	artesian	----

NOTES:

ug/L = Micrograms per liter

VOCs - volatile organic compounds determined by USEPA Method 8260

NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998

The MTBE ground water standard is from NYSDEC's TAGM 8086

- Bold white type with black background indicates exceedance of the NYSDEC Standards or Guidance Value

J = Results greater than the reporting limit that are considered estimated.

UJ= Results less than the reporting limit that are considered estimated.

---- = the compound was not detected at a concentration above the laboratory reporting limit

Natural Attenuation Parameters are used to characterize the physical, chemical and biological response of a hydrologic system to contamination.

Dissolved Oxygen, Oxidation Reduction Potential, pH and conductivity were measured in the field using a Horiba U-22 and flow through cell just prior to collecting samples.

Ferrous Iron concentration were measured using a HACH Test Kit

Ferrous Iron and DO are reported in mg/L

pH is reported in standard units

Oxidation Reduction Potential is reported in mV

Conductivity is reported in ms/cm

Odor = "Petroleum-like" odor

mg/L= Milligrams per liter

Sheen= Sheen on purge water and/or sample

A

APPENDIX A

ADDENDUM TO THE HEALTH AND SAFETY PLAN

Final Health and Safety Plan Addendum to Supplemental Remedial Investigation/Focused Feasibility Study

174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

Revised August 2010

Air National Guard
Andrews AFB, Maryland

Final Health and Safety Plan Addendum to Supplemental Remedial Investigation/Focused Feasibility Study

174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

Revised August 2010

Prepared For:

Air National Guard
Andrews AFB, Maryland

Prepared By:

ERM®

Environmental Resources Management
5788 Widewaters Parkway
Dewitt, New York 13214

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

Acronym	Definition
ANG	Air National Guard
BEX	Benzene, ethylbenzene and xylenes
CFR	Code of Federal Regulations
COCs	Constituents of Concern
CRC	Contamination Reduction Corridor
CRZ	Contamination Reduction Zone
EPA	Environmental Protection Agency
ERM	Environmental Resource Management
ERP	Environmental Restoration Project
FID	Flame Ionization Detector
HASP	Health and Safety Plan
IDLH	Immediately Dangerous to Life or Health
IRA	Interim Remedial Action
IRAWP	Interim Remedial Action Work Plan
IRP	Installation Restoration Plan
KV	Kilovolts
LEL	Lower Explosive Limit
MSDS	Material Safety Data Sheets
NGB/ A7CVR	Air National Guard/Environmental Restoration Program Branch
NFPA	National Fire Protection Agency
NIOSH	National Institute for Occupational Safety and Health
NYS DEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
ORM	Oxygen Releasing Material
PAH	Poly-nuclear Aromatic Hydrocarbon
PEL	Permissible Exposure Limit
PID	Photo-ionization Detector
PPE	Personal Protective Equipment
RSCO	Recommended Soil Cleanup Objective
SCBA	Self-Contained Breathing Apparatus
SIC	Standard Industrial Classification
SVOC	Semi-volatile Organic Compound
TLV	Threshold Limit Value
TPH	Total Petroleum Hydrocarbons
UV	Ultraviolet
VOC	Volatile Organic Compound
WBGT	Wet Bulb Globe Temperature

SECTION 1.0

INTRODUCTION

1.1 Purpose and Scope

This document is a site-specific Health and Safety Plan (HASP) for a the Draft Final Supplemental Remedial Investigation/Focused Feasibility Study Work Plan Addendum at the Site 15 Hancock Air National Guard Base in Syracuse, New York (Figure 1-1 of Work Plan). This plan describes rules and procedures that Environmental Resource Management (ERM) and subcontractor personnel will follow to perform their duties safely, competently, and in compliance with all applicable federal, state, and local statutes and regulations. Nothing in this plan operates to relieve the contractor or its subcontractors of its responsibilities for the safety and health of its workers and compliance with this plan. Subcontractors are required to provide their own HASP, which must meet the requirements outlined in this HASP at a minimum.

This plan provides the health and safety guidance for protecting workers during operations governed by the Occupational Safety and Health Administration (OSHA) contained in the 29 Code of Federal Regulations (CFR) Section 1910.120. Managerial, professional, and technical personnel should use this plan as a guide to proper health and safety procedures while working at this ANG base. Please note: Since the material to be removed during this project is non-hazardous petroleum-affected soil, all work will be performed in modified Level D unless otherwise specified by the on-site Health and Safety officer. Specific work zones will be applicable if hazardous waste is encountered.

1.2 Health and Safety Plan Overview

This Health and Safety Plan has the following objectives:

- Promote a safe and healthful work environment.
- Minimize the risk of human, environmental, and economic losses resulting from accidents.

- Comply with safety and health laws, regulations, and policies.
- Perform health and safety tasks efficiently.
- Satisfy ANG program needs.

Successful implementation of this plan requires cooperation between contractor personnel and ANG staff. All contractor personnel are expected to accept the responsibility to use all materials and equipment properly, to follow work procedures and rules, and to aid field supervisors in identifying and correcting unsafe conditions.

All ERM personnel are required to read and abide by this project specific HASP and sign a plan acceptance form (Figure A1.1). This form will be kept in the project files.

1.3 Hazard Identification

Unsafe and unhealthy conditions at Site 15 will be identified through one or more of the following:

- Investigating and observing work areas and work practices and looking for present or potential health and safety problems;
- Investigating work-related injuries and illness (or near-misses) to identify problems that need correction; and
- Evaluating worker suggestions or complaints.

This site-specific HASP includes the following sections:

- A description of the site and tasks to be performed;
- A description of the site or work area history;
- A route to the hospital;
- A site-specific or task-specific hazard assessment that includes identification and characterization of potential physical and chemical hazards;
- Monitoring requirements and establishment of exposure limits for specific chemical parameters;
- Personal protective equipment for each task;

- Work site safety requirements;
- Site control guidelines;
- Exposure precautions;
- Site entry guidelines;
- Decontamination guidelines;
- Waste handling and disposal guidelines;
- Contingency plans;
- Specific task guidelines (such as confined space entry);
- An approval statement;
- HASP acceptance forms; and
- Attachments.

This site-specific HASP is subject to review and approval by the site manager.

1.4 Project Work Scope Overview

ERM is assisting the Air National Guard (ANG) with an Interim Remedial Action (IRA) at Site 15 of the 174th Fighter Wing (FW), Hancock Air National Guard Base (Hancock ANGB) in DeWitt, New York (the Site). The ANG requested ERM to prepare a technical and cost proposal associated with their 3 April 2008 letter and Statement of Work (SOW) titled" Environmental Restoration Program Statement of Work for Supplemental Remedial Investigation at 174th Fighter Wing; Hancock ANGB; Syracuse, New York"; Project Number: HAAW20077054 dated 3 April 2008. The ANG accepted ERM's technical and cost proposal on 11 June 2008.

ERM has prepared this Work Plan to describe the Work Plan Addendum Supplemental Remedial Investigation/Focused Feasibility Study (SRI/FFS) tasks that are proposed to define the extent of benzene, ethylbenzene and xylenes (BEX) in groundwater in off-site portions of the dissolved plume. In addition, an enhanced in situ bioremediation pilot study will be performed. The results of the Supplemental Remedial Investigation (SRI) portion of the project and associated sampling of the monitoring wells after completion of the pilot test will be used to refine the remedial alternative(s) recommended in the Draft Feasibility Study Report (ERM, August 2008 (currently being completed)).

Review of laboratory analytical results from ERM's June 2008 Technical Memorandum (TM), for the off-site plume delineation indicated that benzene, ethylbenzene, and xylenes were detected in off-site groundwater at concentrations above ambient groundwater quality standards and guidance values established by the New York State Department of Environmental Conservation (NYSDEC). Toluene and MTBE were not detected at concentrations above applicable standards, criteria, and guidance (SCGs) in any of the wells sampled during the plume delineation, suggesting that toluene and methyl tert butyl ether (MTBE) are not compounds of potential concern at Site 15 or the off-site property.

Based on these results, ERM concluded that the extent of BEX affected groundwater has been delineated on the Hancock ANGB property, Brooklawn Golf Course (BGC) property and the Ram Tech Consulting Corporation (RamTech) property. However, available data suggests that BEX-affected groundwater also extends beyond the RamTech property towards the south and/or southeast to neighboring property owned by General Electric (GE) and others.

Based upon the relatively rapid expansion of the BEX plume and the moderate concentration of BEX materials encountered on the RamTech property, ERM recommended that additional delineation work be performed down-gradient of the RamTech property. Due to an anticipated delay in securing access agreements from GE, ERM also recommended that consideration be given to performing enhanced in situ bioremediation as soon as possible to minimize further down-gradient migration of dissolved-phase BEX in groundwater.

1.5 Site Description

The below site description information was obtained from the Proposed Remedial Action Plan for Hancock Air National Guard Site 15 (Parsons, 2004).

Site 15 is part of land used by the 174th Fighter Wing of the New York Air National Guard. The entire site located within the Air National Guard Base at Hancock Field directly adjacent to the Syracuse Hancock Airport. The Air National Guard facility at Hancock Field is bordered by the Town of Dewitt to the east and south, the Town of Salina to the west, and the Town of Cicero to the north. Syracuse International Airport is located directly to the north of the Air National Guard facility (Parsons, 2004).

Site 15 is approximately 2.5 acres in area consisting of brush vegetation, wooded vegetation in the southern portion adjacent to Molloy Road, a large concrete pad, a bermed area where a 215,000-gallon aboveground tank was formerly located, and two drainage swales. One drainage swale borders the site on its north-northeast side, and a second drainage swale is located along the west side of the site. The drainage swales contain water only intermittently following storm events. Water within the drainage swales does not appear to be hydraulically connected to underlying groundwater (Parsons 2004).

Several site structures were removed as part of a removal action for PCB-impacted soils. The foundation of the former pump house and associated underground structures, consisting of six underground tanks, three drainage sumps, and an oil-water separator were recently removed. Additionally, a transformer pad adjacent to the southeast side of the former pump house was removed (Parsons 2004).

1.6 Site History

The petroleum storage area at Site 15 was constructed in 1951 and used until 1999 when it was decommissioned and a new petroleum storage area was constructed. When the area was actively used, it was the site of the Jet Fuel Transfer Pump house (Building 602), a 215,000-gallon AST, six 25,000 USTs, and equipment for transferring JP-4 to the tanks. In 1999, the pump house was demolished, the AST was cleaned and removed, and the USTs were cleaned and filled in place.

Three spills have reportedly occurred at the site:

- In the 1980s, PCBs were released, possibly from the transformers located in front of the pump house (Metcalf and Eddy (M&E), 1995).
- In April 1990, 3,850 gallons of JP-4 were released inside the pump house. Some of the fuel reportedly flowed out of the building (M&E, 1995).
- In June 1994, 150 gallons of JP-8 overflowed onto the ground from USTs under the northeast side of the building. The spill was reportedly contained with absorbent pads before it was able to exit through the drainage ditch on the east side of the site (M&E, 1995, and Aneptek, 1999).

Following the April 1990 release, contaminated surface soil was removed and the excavation area was backfilled with crushed stone. During cleanup, an oil-water separator and three area drainage sumps with PCB-contaminated sediment were discovered. The oil-water separator was installed in the 1950s, but was never connected to a holding tank. Product emptied into a drywell and eventually drained into the underlying soil. Spilled fuel had entered the sumps and mixed with the PCB-contaminated sediment, which is believed to have accumulated in the sumps before 1971 (M&E, 1995).

FIGURE A1-1

Plan Acceptance Form – Project Health and Safty Plan

Plan Acceptance Form
Project Health and Safety Plan

(For ERM and subcontractor employees only)

I have read and agree to abide by the contents of the Work Plan and Health and Safety Plan for the following project:

______________________ ______________________

(Project Title) (Project Number)

Furthermore, I have read and am familiar with the work plan or proposal which describes the field work to be conducted and the procedures to be utilized in the conduct of this work.

Name (print)	Signature	Date

Place in project Health and Safety File as soon as possible.

SECTION 2.0

PROJECT ORGANIZATION AND RESPONSIBLITY

2.1 Organization

This section describes the responsibilities of all onsite personnel associated with the New York ANG at Hancock Field. Principal Contractor personnel associated with this project are listed in Table A2.1.

2.2 Responsibilities

The Program Manager designates a Health and Safety Program Manager to establish and implement a Health and Safety Plan (HASP). The Program Manager and ANG shall review and approve this site-specific HASP. The Program Manager shall ensure that the Health and Safety Program Manager updates the plan annually, at a minimum. The Program Manager and the ANG must approve any revisions to this plan.

2.2.1 Project Manager

The Project Manager reports to the Program Manager, has authority to direct response operations, and assumes total control over project activities.

The Project Manager is responsible for the following:

- Obtaining permission for site access and coordinating activities with appropriate officials;
- Briefing the field teams on their specific assignments;
- Using the Program Health and Safety Manager and the Site Health and Safety Coordinator to ensure that safety and health requirements are met;
- Serving as the liaison with public officials;

- Ensuring that the project budget is adequate for the necessary health and safety procedures and equipment;
- Ensuring that the plan satisfies all federal, state, and local statutes, regulations, and ordinances concerning health and safety;
- Developing training materials;
- Setting up and conducting necessary training programs;
- Conducting audits to ensure compliance with the health and safety program;
- Updating the health and safety plan and program to meet new requirements and technologies;
- Maintaining program records;
- Reviewing and approving project health and safety plans for certain hazardous operations (e.g., Levels A and B activities, drum opening operations, etc); and
- Reviewing subcontractor HASPs.

2.2.2 Site Health and Safety Coordinator

The Site Health and Safety Coordinator reports to the Program Health and Safety Manager and advises the Field Manager and Program Health and Safety Manager of all unusual aspects of health and safety on site. The Site Health and Safety Coordinator is authorized to stop work if any operation threatens worker and/or public health or safety. The Site Health and Safety Coordinator is also responsible for the following:

- Inspecting protective clothing and equipment periodically;
- Ensuring that protective clothing and equipment are properly stored and maintained;
- Controlling entry and exit at the access points;
- Coordinating safety and health program activities with the Program Health and Safety Manager;
- Monitoring the work parties for signs of stress such as cold exposure and heat stress;

- Implementing the site safety plan;
- Conducting periodic inspections to determine if the site safety plan is being followed;
- Knowing emergency procedures and evacuation routes;
- Posting telephone numbers of emergency medical help, local hospitals, the poison control center, the fire department, and the police department;
- Notifying, when necessary, local public emergency officials;
- Coordinating emergency medical care;
- Setting up decontamination solutions appropriate for the type of chemical contamination onsite;
- Controlling the decontamination of all equipment, personnel, and samples;
- Assuring the proper disposal of contaminated clothing and materials
- Ensuring that all required equipment is available;
- Advising medical personnel of potential exposures and consequences; and
- Notifying emergency response personnel by telephone or radio in the event of an emergency.

2.2.3 Field Team

All work parties must consist of a minimum of two people. All field team members must comply with the Program HASP as well as this site-specific HASP. Field team members are to report any suspected unsafe conditions to the site health and safety coordinator and stop working if emergency conditions arise.

2.2.4 Subcontractors

Subcontractors must be trained in accordance with 29 CFR Section 1910.120 prior to their admittance to the site and must comply with the training requirements specified in Section 6.0 of this HASP to the extent they will be performing work under the contractor's direction. As with all subcontractors, the responsibility for protecting the health and safety of subcontractor employees rests with the subcontractor; therefore, the subcontractor must submit an HASP to the Health and Safety Manager that identifies safety procedures for the field activities to be performed. Before beginning any field activity, the subcontractor must provide to the site health and safety coordinator documentation of necessary training and proof of participation in a medical monitoring program. This documentation will be kept in the project file.

TABLE A2-1

Principal Contractor Personnel

PRINCIPAL CONTRACTOR PERSONNEL	
Client Sponsor	Jody Murata (301) 836-8120
Project Manager	David W. Myers (518) 461-8936
Program Health and Safety Manager	Ernest Sweet (315) 445-2554
Field Manager	Robert Sents (315) 445-2554
Site Health and Safety Coordinator	Robert Sents (315) 445-2554

SECTION 3.0

EMERGENCY RESPONSE PLAN

3.1 Personnel Roles and Lines of Authority

The Site Health and Safety Coordinator or Program Health and Safety Manager supervises the field team to ensure they are meeting health and safety requirements. If deficiencies are noted, work is stopped and corrective action is taken (e.g., purchase of additional safety equipment). Reports of health and safety deficiencies and the corrective action taken are forwarded to the Project Manager and Program Health and Safety Manager.

All contractor personnel receive site-specific health and safety training before starting any site activities. On a day-to-day basis, workers should watch for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Emergencies can be averted by rapid recognition of dangerous situations. Before assigning daily tasks, tailgate safety meetings will be held by the Site Health and Safety Coordinator. Discussion should include:

- Tasks to be performed;
- Time constraints (e.g., work period duration and rest breaks);
- Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, and danger signals;
- Emergency procedures; and
- Communication.

3.2 Emergency Contacts

In the event of any situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the list below. For emergency situations, contact should first be made with the site coordinator who will notify emergency personnel who will then contact the appropriate response teams. <u>This emergency contacts list must be in an easily accessible location at the site.</u>

Contingency Contacts	**Phone Number**
Nearest phone located on site	(315) 233-2111 (Tim Sager)
Fire Department	911
Sheriff	911
Ambulance Service	911
Poison Control Center (Syracuse, PA)	(315) 476-4766 (800) 252-5655
Pollution Toxic Chemical Oil Spills	(800) 424-8802
Medical Emergency	
Hospital Name	SUNY Upstate Medical University Hospital
Hospital Phone Number	(315) 464-5611, Emergcy (adult)
Hospial Address	750 East Adams Street Syracuse, NY 13210
Map to Hospital	Figure A3.1

3.3 Hospital Emergency Route

Directions to the hospital are shown on Figure A3.1 and are as follows:

Turn LEFT out of ANG base onto MOLLOY ROAD, heading EAST

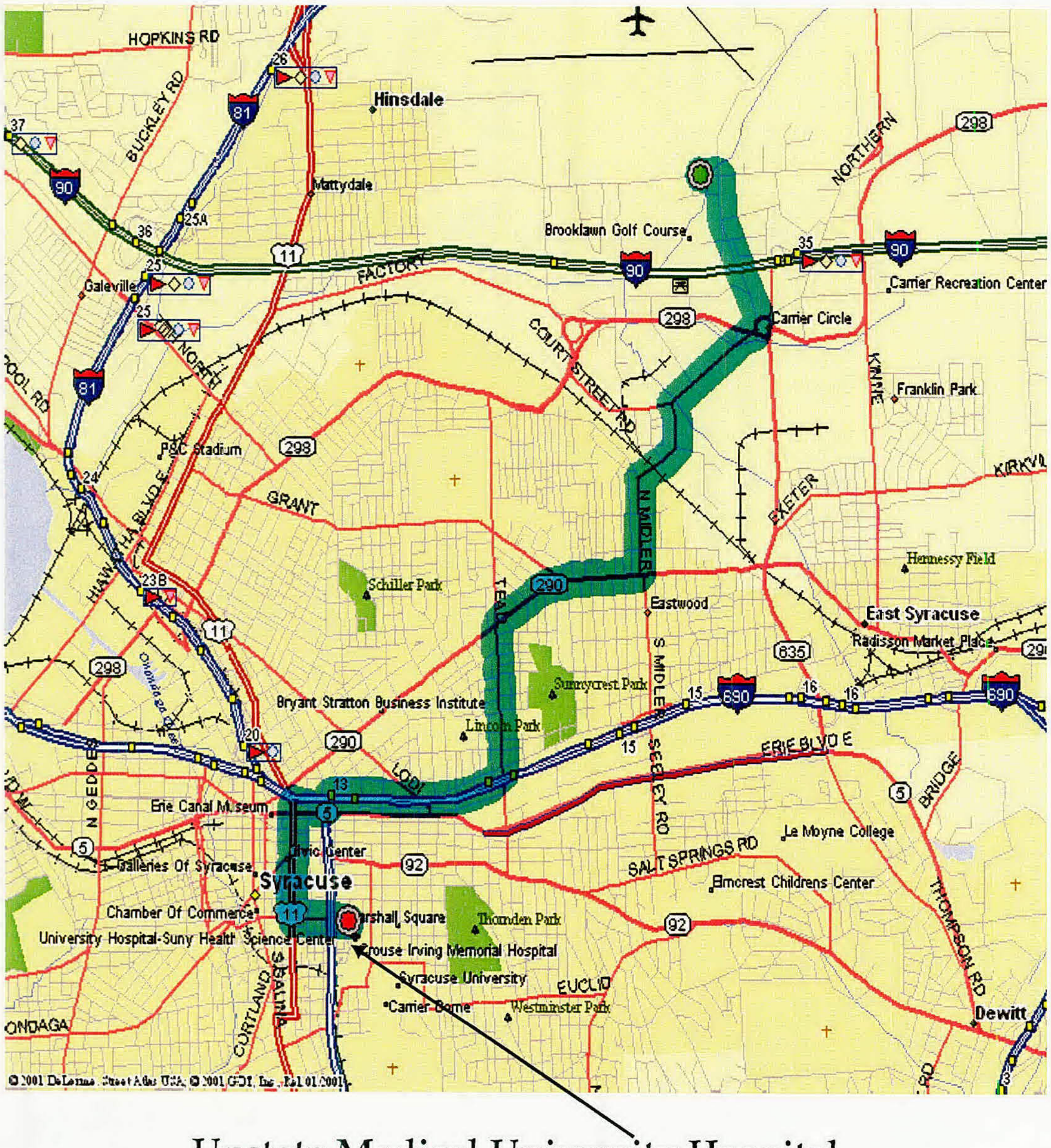
- Turn RIGHT onto THOMPSON ROAD
- Bear LEFT onto SR 298 (THOMPSON ROAD)
- Bear RIGHT onto COURT STREET ROAD
- Turn LEFT onto NORTH MIDLER AVENUE
- Turn RIGHT onto SR 290 (JAMES STREET)
- Turn LEFT onto TEAL AVENUE
- Turn RIGHT onto RAMP TO I-690
- Bear RIGHT onto I-690
- Turn LEFT onto RAMP TO US 11 (NORTH STATE STREET)
- Turn LEFT onto US 11 (NORTH STATE STREET)
- Turn LEFT onto EAST ADAMS STREET

ERM Emergency Response Contacts

Project Manager: David W. Myers	(518) 461-8936
Health & Safety Officer: Ernest Sweet	(315) 445-2554

FIGURE A3-1

Route To Hospital



©2001 DeLorme. Street Atlas USA; ©2001 GDT, Inc., Rel. 01/2001

Upstate Medical University Hospital

3.4 Emergency Procedures

3.4.1 Introduction

If an emergency develops on site, the procedures delineated in this site-specific HASP are to be immediately followed. This site-specific HASP adheres to procedures established in the program health and safety plan. Emergency conditions exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure;
- A condition occurs that is more hazardous than anticipated; and
- Fires, explosions, structural collapses/failures, and/or unusual weather conditions (thunderstorms, lightning, high winds, etc.) occur.

If an emergency occurs, direct voice communication is used to sound the alarm. If personnel are out of range of direct voice communication, an emergency warning signal will be sounded. General emergency procedures and specific procedures for personal injury are described within this section. A list of emergency contacts are provided above and must be posted conspicuously on site.

3.4.2 General Emergency Procedures

The emergency procedures are as follows:

- Notify the contact identified in the emergency contact table of this HASP when an emergency occurs. This list is should be posted prominently at the site.
- Use the "buddy" system (pairs).
- Maintain visual contact between "pairs." Each team member should remain close to the other to assist in case of emergencies.
- If any member of the field crew experiences any adverse effects or symptoms of exposure, the entire field crew will immediately halt work and act according to the instructions provided by the Site Health and Safety Coordinator.

- Any condition that suggests a situation more hazardous than anticipated will result in evacuating the field team and re-evaluating the hazard and the level of protection required.

- If an accident occurs, the Site Health and Safety Coordinator are to complete an Accident Report Form (See Figure A3.2). Follow-up action will be taken to correct the situation that caused the accident.

3.4.3 Injuries and Illnesses

In case of personal injury at the site, follow the procedures listed below:

- Field team members or onsite emergency medical technicians trained in first aid will administer treatment to an injured worker if appropriate.

- The victim will be transported to the nearest hospital or medical center if necessary. An ambulance will be called to transport the victim if needed.

- The Site Health and Safety Coordinator are responsible for the completion of an Accident Report Form.

3.4.4 Fire or Explosion

Health and Safety Coordinator shall:

- Notify the paramedics and/or fire department, as necessary.

- Signal the evacuation procedure outlined in this HASP and implement the entire procedure.

- Isolate the area.

- Stay upwind of any fire.

- Keep areas surrounding the problem source clear after the incident occurs.

3.4.5 Hazardous Materials Release

In the event of a spill, immediately contact the local hazardous response team. Emergency contacts, numbers, lines of authority, and evacuation routes are provided above. Federal, state, and local planning or response groups must also be notified.

3.4.6 Standard Safe Work Practices

The following are considered standard safe work practices:

1. Eating, drinking, chewing tobacco, smoking, and carrying matches or lighters are prohibited in a contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.
2. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surfaces (i.e., ground, etc.).
3. Acknowledge crew member senses which alert to potentially dangerous situations in which they should not become involved (i.e., presence of strong and irritating or nauseating odors).
4. Prevent spills to the extent possible. In the event that a spill occurs, contain liquid if possible.
5. Field crew members shall be familiar with the physical characteristics of investigations, including:
    - Wind direction in relation to nearby buildings;
    - Accessibility to associates, equipment, vehicles communication;
    - Hot zone (areas of known or suspected contamination);
    - Site access; and
    - Nearest water sources.
6. All wastes generated during activities onsite should be disposed of as directed by the project manager or onsite Health and Safety Coordinator.
7. Protective equipment as specified in Section 7.0 will be utilized by workers during the drilling and confirmatory sampling procedures.

3.4.7 Personal Protective Equipment Failure

Before donning PPE, workers should fully inspect all PPE. If PPE fails during site work, evacuate the area, remove and dispose of equipment, and replace it with new equipment.

3.5 Accident/Incident Reporting

Reporting and investigation of accidents are important parts of any health and safety program. They provide safety personnel with the means for objective evaluation of the progress and effectiveness of the health and safety program. Additionally, they allow the safety officer to identify problem areas where preventive measures can be taken. For corrective or preventive measures to be effective, reports on the causes of the accident must be unbiased. The purpose of an accident report is to obtain information, not to affix blame.

The Occupational Safety and Health Act (OSHA) requires that certain elements be included in all accident reports (29 CFR Part 1094). These elements are met by the contractor's Accident Report Form (Figure A3.2). The Project Manager or Project Health and Safety Manager is responsible for the documentation of all field injuries. Information concerning a field injury must be reported to the Contractor Program Health and Safety Manager as soon as possible. An additional ERM incident form is also provided in Appendix A - Pertinent Health and Safety Documents.

FIGURE A3-2
Accident Report Form

ACCIDENT REPORT FORM

Project Name:____

INJURED OR ILL EMPLOYEE

1. Name ______________________ Social Security #______________
   (First) (Middle) (Last)

2. Home Address ____
   (No. and Street) (City or Town) (State and Zip)

3. Age _____ 4. Sex: Male ( ) Female ( )

5. Occupation ____
   (Specific job title, <u>not</u> the specific activity employee was performing at time of injury)

6. Department ____
   (Enter name of department in which injured person is employed, even though theymay have been temporarily working in another department at the time of injury)

EMPLOYER

7. Name ____

8. Mailing Address ____
   (No. and Street) (City or Town) (State and Zip)

9. Location (if different from mailing address):______________________

   ____

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident or exposure ______________________________
    (No. and Street) (City or Town) (State and Zip)

11. Was place of accident or exposure on employer's premises? __(Yes/No)

12. What was the employee doing when injured?______________________

____
(Be specific - was employee using tools or equipment or handling material?)

13. How did the accident occur? ______________________________

____

____

(Describe fully the events that resulted in the injury or occupational illness. Tell what happened and how. Name objects and substances involved. Give details on all factors that led to accident. Use separate sheet if needed)

14. Time of accident: ____________

15. Date of injury or initial diagnosis of occupational illness __________
(Date)

16. WITNESS TO ACCIDENT

______________ ______________ ______________
(Name) (Affiliation) (Phone No.)

______________ ______________ ______________
(Name) (Affiliation) (Phone No.)

______________ ______________ ______________
(Name) (Affiliation) (Phone No.)

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

17. Describe the injury or illness in detail; indicate part of body affected.

____

____

18. Name the object or substance which directly injured the employee. (For example, object that struck employee; the vapor or poison inhaled or swallowed; the chemical or radiation that irritated the skin; or in cases of strains, hernias, etc., the object the employee was lifting, pulling, etc.)

____

____

19. Did the accident result in employee fatality? ______ (Yes or No)

20. Number of lost workdays ____/ restricted workdays _____ resulting from injury or illness?

OTHER

21. Did you see a physician for treatment? ________ (Yes or No) ____________ (Date)

22. Name and address of physician ____

____
(No. and Street) (City or Town) (State and Zip)

23. If hospitalized, name and address of hospital ____________________________

____
(No. and Street) (City or Town) (State and Zip)

Date of report ____________________ Prepared by ____________________

Official position ______________________________

SECTION 4.0

TASK HAZARD ANALYSIS

4.1 Task Hazard Analysis

While working on non-hazardous and hazardous waste sites on ANG bases, contractor personnel are likely to encounter chemical and physical hazards. These hazards are associated primarily with preparation for sampling and/or remediation activities. The chemical and physical hazards are detailed in Section 5. The site-specific activity analysis for the proposed soil sampling and drilling work is provided below.

4.1.1 Soil Sampling

Hazards of handling soil while sampling include potential exposure to chemicals. Employees may be working next to an active drilling equipment, so drilling safety applies to their activities. Other hazards include risk of slip, trip and fall, lacerations and contusions, noise-induced hearing loss from exposure to excessive noise from any power equipment. Employees shall keep clothing dry with adequate rain gear. Use proper personal protective clothing, to include splash protection if baling by hand during sampling. Inspect equipment to ensure that it is proper working order. All handling of potentially contaminated soils will begin in Level D with careful monitoring of the sampler's breathing zone using the Photoionization Detector (PID). Outer nitrile and inner latex gloves will be included in standard Level D requirements whenever handling samples. Since this is non-hazardous soil material, upgrades are not anticipated.

Refer to the following references:

29 CFR 1926.200	Accident Prevention Signs and Tags
29 CFR 1926.201	Signaling
29 CFR 1926.202	Barricades
29 CFR 1926.600	Equipment
29 CFR 1926.601	Motor Vehicles
29 CFR 1926.602	Material Handling Equipment

4.1.2 Drilling Work

Prior to any drilling work being performed, ERM's Task Hazard Analysis form and the Subsurface Clearance form attached in Appendix A will be completed by ERM's Site Health and Safety Officer and a qualified representative opf the project subcontractor.

Chemical exposure typically occurs as drilling operations proceed. If contaminant levels reach action limits as specified in Section 8.0, upgrades in personal protection will be initiated. Equipment Operators and geologists on site within 50 feet of the drilling equipment shall start work in Level D PPE and will include use of hearing protection when the equipment is operational.

If any 'hot" work is required proper coordination with the Hancock ANG Fire Department will be required. In addition, ERM's hot work permit, presented in Attachment A, will have to be completed.

SECTION 5.0

SAFETY AND HEALTH ANALYSIS

5.1 Chemical Hazards

The chemicals of primary concern that may be encountered and may be associated with Site 15 will be those originating from previous jet fueling activities. Compounds of primary concern generally include BEX. Other compounds were also detected, but did not exceed soil criteria. These compounds can be taken into the body by oral ingestion, by absorption through the skin, and by inhalation. Action Levels for Site 15 are discussed in Section 8.11.

In addition to the chemicals that may be present on site, personnel may bring chemicals onto the site (e.g., for equipment decontamination) that could pose health hazards. Material Safety Data Sheets (MSDSs) for these chemicals will be brought on site when used.

5.2 Physical Hazards

5.2.1 Subsurface Hazards

Before any excavation or drilling operations are performed, efforts must be made to determine if underground installations (e.g., sewers, telephone, water, fuel, electrical lines or liners) will be encountered, and, if so, where such underground installations are located. Utility companies and/or facility engineering shall be contacted before starting any subsurface activities and information concerning buried utilities shall be obtained.

5.2.2 Motor Vehicles and Heavy Equipment

Working adjacent to heavy equipment can be a major hazard at a site. Injuries can result from equipment hitting or running over personnel, or from the overturning of vehicles. Vehicles and heavy equipment design and operation will be according to 29 CFR Subpart O, 1926.600 through 1926.602. In particular, the following precautions shall be used by the subcontractor to help prevent injuries and accidents:

- Brakes, hydraulics lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices will be checked and recorded on a log sheet at the beginning of each week.
- Heavy equipment will not be backed up unless the vehicle has a reverse signal alarm audible above the surrounding noise level or a signal man is present.

Because heavy equipment can be an ignition source, spark arrestors will be included on all heavy equipment as standard equipment. These will prevent sparks from the engine igniting potentially explosive atmospheres. All heavy equipment will be inspected for the presence of spark arrestors prior to performing work on the site.

5.2.3 Overhead Electrical Lines

Precautions will be exercised when drilling near any overhead electrical lines. The minimum clearance between overhead electrical lines of 50 kilovolts (KV) or less and the drill rig is 10 feet. For line rated over 50 KV, the Field Manager will verify that the minimum clearance between the line and any part of the rig is 10 feet plus 0.4 inch for each KV over 50 KV. The site Health and Safety Coordinator will contact the utility company to determine the kilovolts of electrical lines.

5.2.4 Noise-Induced Hearing Loss

Planned activities at Site 15 involve the use of heavy equipment. The unprotected exposure of site workers to this noise during activities can result in noise-induced hearing loss. The site Health and Safety Coordinator will ensure that either earmuffs or disposal foam earplugs are made available to all personnel near sources of high intensity noise.

5.2.5 Slip, Trip, and Fall Hazard

Site 15 may contain slip, trip, and fall hazards for site workers, such as:

- Holes, pits or ditches;
- Slippery surfaces;

- Steep grades;
- Uneven grades; and
- Sharp object, such as nails, metal shards, and broken glass.

Site personnel will be instructed to look for potential safety hazards and immediately inform the site Health and Safety Coordinator or the Field Manager about any new hazards. If the hazards cannot be immediately removed, actions must be taken to warn site workers about the hazard.

5.2.6 Rigging Equipment for Material Handling

Ropes, u-bolts, wires, and clamps used in drilling must be inspected prior to use and periodically during the course of the project to ensure the equipment is safe. Defective equipment must be removed from service. Rigging equipment must never exceed its recommended safe working load. The manufactures' recommendations shall be followed in determining the safe working loads of the various size and types of hooks used during drilling.

5.2.7 Electric and Energized Lines

All electrical equipment and energized lines shall be considered energized until isolated, tested or otherwise determined to be de-energized and grounded. A qualified electrician will verify all electrical lines that may interfere with work activities are locked out and tagged. To prevent physical contact with energized power lines, equipment or machines shall not be operated within 10 feet of any power line rated at 50 KV or below. This 10-foot rule will strictly be enforced at all times.

Daily inspections on all electrical equipment prior to distribution to employees will be performed by a competent person. Tools that do not pass inspection will be removed from service until repaired or replaced. All tools, cords and receptacles will be tested monthly for ground continuity, correct conductor termination and inspected for defects. All repairs to be made on electrical tools and equipment will be performed by a certified electrician. Records detailing the inspection and repair of electrical equipment will be kept with tool number, type, date inspected, repairs, and other comments.

5.2.8 Cranes and Lifting Devices

All lifting activities conducted will comply with all federal, state, and local laws; safe practices prescribed by the manufacturer of crane; and generally followed by the construction industry.

All contractors will use only those cranes and other hoisting equipment which are maintained in safe working conditions. All hoisting equipment brought onto the project site will be inspected for structural integrity, smooth operations performance, and proper functioning of all critical safety devices. The site Health and Safety Coordinator will conduct the inspection in conjunction with the crane operator. Any piece of equipment found not to be in compliance with these operation and safety requirements will not be put into service until all necessary repairs have been made.

Only qualified crane operators familiar with their equipment are permitted to operate the crane. Subcontractors are required to present proof of their operators' capability and experience to operate the crane in a safe manner.

All hooks, slings, and other fittings shall be the correct size for the task being performed. The use of defective or damaged hooks, pins, shackles, or other fitting attachments is prohibited. Chain or wire rope shall be free of kinks, sharp bends, or twists. All such items must have sufficient strength (including an ample margin of safety) to safely hoist the anticipated load. All rigging equipment shall be inspected prior to use to verify good working conditions.

No one is allowed to stand or walk beneath crane booms. No one is permitted to ride loads, hooks, medicine balls, or slings suspended from hoisting equipment. Booms will not be permitted to operate within 10 feet of an energized power line.

Side pulls should be avoided in all cases. The load must be directly under the hoist. The safety "throat" latch must be in the closed position at all times during a lift. Accessible areas within the swing radius will be barricaded to prevent injury. No crane will operate in a heavy lift mode without its outriggers fully extended to assure maximum stabilization of the equipment.

5.2.9 Biological Hazards

The planned field activities may bring contractor personnel into contact with snakes, spiders, ticks, chiggers, mosquitoes and poisonous plants (poison ivy and poison oak). The following precautions will be taken as necessary by field personnel to avoid contact with biological hazards:

- Hat to ward off insects;
- Snake guards;
- Insect/tick spray, especially on hat, ankles, wrist, and waist (may only be used when not operating a photo-ionization detector (PID) and not collecting samples);
- Use of Tyvek™ suit sealed with duct tape at ankles and wrist;
- Use of Oak-N-Ivy™ cleanser or equivalent at field hand-wash station; and
- Wash hands, face, and other exposed skin after each work period, and take a hot shower at the end of each day.

5.2.10 Sunburn

Sunscreen and/or sun visors should be worn when work must be performed in the heat of the day and where no shelter is available. Shade or air conditioned areas must be available on site for rest periods to reduce the likelihood of heat stress.

5.2.11 Fire or Explosion

Several flammable materials (e.g., fuels, cutting gases, waste oils, etc.) may be stored at or brought onto the site. To reduce the risk of fire and explosion, small quantities of flammable liquids must be stored in approved "safety" cans and labeled according to contents. Bulk storage of flammable materials should only be allowed in areas designated for this purpose. Open flames must be prohibited within 50 feet of flammable storage areas. Flammable materials in confined spaces can produce an explosive atmosphere which can be ignited by a spark or other energy source. OSHA standards for fire protection and prevention, and welding and cutting are contained in 29 CFR, Subpart F, 1926.150 through 1926.154 and 29 CFR, Subpart J, 1926.350 through 1926.354, respectively.

Of particular concern are:

- Proper storage of flammable chemicals;
- Adequate numbers and types of fire extinguishers;
- Proper handling of cutting equipment, cylinders, and hoses;
- Allowing open flames or cutting only in certain locations and with appropriate precautions; and
- Proper use of mechanical or local exhaust ventilation.

Gasoline vapors can be highly explosive, having a flash point of about -40°F. Diesel oil is combustible, with a flash point of 110°F to 190°F, and is considered to be a moderate fire hazard. Ethylene glycol is considered to be a slight fire hazard (flash point of 232°F) and a moderate explosion hazard.

5.2.12 Other Hazards

Other physical hazards at Site 15 may include vehicular traffic, overhead power lines, and underground utilities. Safe work practices will be used to avoid all unnecessary hazards.

SECTION 6.0

TRAINING AND MEDICAL MONITORING REQUIREMENTS

Training is the foundation upon which all other protective measures depend. All contractor health and safety training programs will cover:

- The contractor health and safety policy;
- Understanding of the hazards of the work;
- Safe work practices;
- Standard health and safety procedures;
- Protective clothing, equipment, or engineering controls (where appropriate);
- Emergency procedures; and
- Contractor's personnel rights and responsibilities under OSHA.

The content and extent of health and safety training will depend on the nature of the work and the responsibilities of the personnel performing the work. At a minimum, all contractor personnel must be given training in the overall contractor health and safety program. Additionally. all onsite personnel are required to read and abide by this site-specific HASP.

The medical surveillance program is a major element in the contractor health and safety program. The two major components of the program are (1) routine monitoring of the health of contractor personnel whose work may expose them to health hazards and (2) arrangements for emergency medical care in the event of work-related health emergencies.

6.1 Site Safety Training Requirements

All onsite personnel must have received 40 hours of initial training in hazardous waste operations before participating in IRP projects, as required by 29 CFR Part 1910.120(e). All onsite personnel must be up to date on their annual 8-hour refresher training. Prior to beginning site activities, all contractor and subcontractor personnel must present certificates of the above training and evidence of participation in an annual medical monitoring program to the Site Health and Safety Coordinator or Project Manager. Additionally, CPR and first aid certification will be required for onsite personnel. This information will be kept in the project files.

Prior to beginning work on a site, the Site Health and Safety Coordinator will provide a briefing that covers the following topics:

- History of site;
- Hazards at the site;
- Proper use of personal protective equipment;
- Work practices by which the employee can minimize risk from hazards;
- Work zones and their locations, and the level of protection to be used in each zone on the site;
- Acute effects of compounds at the site;
- Decontamination procedures; and
- Emergency procedures, evacuation routes, and emergency telephone numbers.

Tailgate safety meetings will be held daily and as appropriate as site tasks or safety conditions change (i.e., PPE upgrade, weather condition change). Topics covered will include a review of the anticipated activities, the appropriate safety procedures, and any associated physical or chemical hazards. The meeting will be recorded on the tailgate safety meeting form (Figure A6-1). All personnel attending the meeting must sign the form. Records of this training will be maintained in the project files.

6.2 Medical Monitoring Requirements

Personnel engaged in hazardous waste operations are required to be enrolled in a medical monitoring program as required by 29 CFR Part 1910.120(f). The medical monitoring program is conducted using the services of licensed, local occupational physicians. All examinations will include tests and analyses appropriate to the nature of the work the employee will be required to perform.

6.2.1 Pre-placement Screening

All contractor personnel who will be involved in the medical monitoring program must have an initial physical examination before assignment to work requiring regular health monitoring. The pre-placement screening has two major functions: (1) to determine contractor personnel's fitness for duty, including the ability to work while wearing protective equipment and (2) to establish a baseline physiological profile for comparison with future medical data.

6.2.2 Periodic Medical Examinations

Periodic medical examinations will be given. Comparison of sequential medical reports with baseline data is essential to determine physiological changes that may mark early signs of adverse health effects and, thereby, may facilitate appropriate protective measures.

The frequency and content of examinations will vary, depending on the nature of the work and exposure. Generally, medical examinations have been recommended annually. More frequent examinations may be necessary, depending on the extent of potential or actual exposure, the duration of the work assignment, and the individual worker's profile.

6.2.3 Termination Examination

A physical examination shall be performed as a part of the checkout procedure for terminating contractor personnel.

6.2.4 Special Examination

Special medical examinations, care, and counseling will be provided in cases of known exposures to toxic substances. Any special tests performed would depend on the substance to which the person was exposed.

6.2.5 Subcontractor's Medical Certification

Subcontractors that are to work at hazardous waste sites must furnish to the Project Manager or Site Health and Safety Coordinator a doctor's certification of each assigned worker's ability to wear personal protective equipment. The certification should be dated not more than one year before subcontractor personnel begin onsite work.

6.2.6 Medical Records

The contractor will keep in a locked file the physician's opinion on specific findings or diagnoses. When a worker terminates employment, the medical file should be archived for 30 years.

FIGURE A6-1

Tailgate Health and Safety Meeting Form

Date:

Specific Location:

Safety Topics Presented:

Protective Clothing/Equipment:

Chemical Hazards:

Physical Hazards:

Other:

Attendees: Signature

Name Printed:

MEETING CONDUCTED BY

Name Printed Signature

SECTION 7.0

PROTECTIVE EQUIPMENT

7.1 Purpose

These guidelines are provided to establish a personal protective equipment and safety equipment program for hazardous waste operations.

7.2 Guidelines

Personal protective equipment (PPE) is needed to ensure the health and safety of field personnel involved with hazardous substances. It can only provide a high degree of protection if it is used properly. Clothing is selected by evaluating the performance characteristics of the clothing against the requirements and limitations of the site- and task-specific conditions. The following areas must be addressed for an effective PPE program:

- Training;
- Work duration;
- Fit testing;
- Donning of equipment;
- In-use monitoring;
- Doffing of equipment;
- Inspection; and
- Storage.

7.3 Considerations for Choice of Protective Clothing

7.3.1 Performance Requirement

Clothing must be able to withstand a variety of physical abuses. The advantages and disadvantages of reusable versus disposable clothing must be considered.

7.3.2 Construction Requirements

The construction requirements of any garment depend on the intended use of the garment. The material that the garment is made of has been selected because of its effectiveness as a barrier against specific hazards there is no such thing as "universal" protection.

1. The physical construction of the garment must prevent penetration (e.g., location of seams and zippers, size of clothing).
2. The material that the garment is constructed of must resist penetration. In some instances, it may be necessary to layer protective clothing to achieve the desired protection.

7.3.3 Permeation Rate

Permeation rate is affected by a combination of the base material, the nature of the chemicals to which the material is exposed, and the duration and nature of exposure. Most materials allow some degree of permeation.

7.3.4 Ease and Cost of Decontamination

Considerations that should be made upon purchasing garments are the ability and degree to which the garment can be decontaminated and the cost of decontamination. Disposable clothing may be advantageous in some situations; however, such clothing is rather expensive in the long run. In most instances, field personnel will use a combination of disposable and reusable clothing.

7.3.5 Protective Materials

The following materials are generally available for a number of garments:

1. Cellulose or paper
2. Natural and synthetic fibers
    - Tyvek™
    - Nomex™
3. Elastomers
    - Polyethylene
    - Saran™-Dow-product
    - Polyvinyl chloride
    - Neoprene
    - Butyl rubber
    - Chlorapel™
    - Viton™

Materials such as Tyvek™ or paper offer little or no protection against hazardous contaminants. Such materials can, however, protect against particulate contaminants. Tyvek™ should be used as an outer covering over the primary protective gear such as splash or fully encapsulating suits. Although Tyvek™ provides little chemical resistance, it does limit the amount of direct contamination on the primary protective gear. Tyvek™ garments are disposable.

Elastomers (polymeric materials that, after being stretched, return to about their original length) provide the best protection against chemical degradation, permeation, and penetration from toxic and corrosive liquids or gases. Elastomers are used in boots, gloves, overalls, and fully encapsulating suits. They are sometimes combined with a flame resistant fabric called Nomex™ to enhance durability and protection.

The abilities of elastomers to resist degradation and permeation range from poor to excellent. The selection of a particular material should be based on its resistance to chemical degradation, as well as on its ability to resist permeation.

Protective clothing containing significant amounts of polyester or other synthetic fibers have the ability to build a static electricity charge from the wearer's movements. If the project site requires non-sparking uniforms due to explosion hazards, cotton/polyester blends for coveralls should be avoided. Zippers manufactured from brass which is non-sparking, should be used on projects where explosion hazards are a concern.

7.4 Selection of Work Ensemble

7.4.1 Protection Level

The individual components of clothing and equipment must be assembled into a full protective ensemble that both protects the worker from the site-specific hazards and minimizes the hazards and drawbacks of the personal protective equipment ensemble itself. Protective clothing selected should provide the maximum chemical protection available while allowing flexibility, dexterity, and visibility. These benefits of protective clothing must often be weighed and compared against increased risk of heat stress. Protective equipment selection must be coordinated with the site Health and Safety Coordinator or Program Health and Safety Manager.

7.4.2 Training

Training in PPE use is required as part of the initial training for all working at the site. This training allows the user to become familiar with the equipment in a non-hazardous environment. As a minimum, the PPE training portion should delineate the user's responsibilities and explain the following:

1. OSHA requirements as delineated in 29 CFR Part 1910 Subparts I and Z.

2. The proper use and maintenance of the selected PPE, including capabilities and limitations.

3. Instruction in inspecting, donning, checking, fitting, and using PPE.

4. Individualized respirator fit testing to ensure proper fit

5. The user's responsibility (if any) for decontamination cleaning, maintenance, and repair of PPE.
6. Emergency procedures and self-rescue in the event of PPE failure.

7.4.3 Work Mission Duration

Before entering a hazardous waste site in personal protective equipment, the anticipated work mission duration must be established in the project health and safety plan. Several factors limit the work mission length. These are:

1. Air supply.
2. The permeation and penetration rates of chemical contaminants.
3. Ambient temperature.

7.4.4 Donning of Equipment

Periodic practice for donning chemical resistant clothing and respirators are required. Assistance should be provided because donning and doffing operations are difficult to perform alone.

After the equipment has been donned, the fit should be evaluated. Clothing that is too small will restrict movement, thus increasing the possibility of tearing the suit and increasing worker fatigue. Clothing that is too large increases the possibility of snagging the suit and the worker's dexterity and coordination may be compromised. In each instance, the worker should be recalled and refitted.

7.4.5 In-Use Monitoring

The wearer of protective clothing must understand all aspects of the clothing's operation and limitation. This is particularly important for fully-encapsulating ensembles where misuse could result in suffocation.

Worker should report any perceived problems or difficulties with equipment to their Project Health and Safety Officer. These malfunctions include, but are not limited to:

- Degradation of protective clothing;

- Perception of odor while wearing a respirator;
- Skin irritation;
- Resistance in breathing during respirator use;
- Fatigue because of respirator use;
- Vision or communication difficulties; and
- Personal responses such as rapid pulse, chest pain, and nausea.

If a supplied-air respirator is being used, all hazards that might endanger the integrity of the air line should be removed from the working area before use. During use, air lines should be kept as short as possible and other workers and vehicles should be excluded from the area.

7.4.6 Doffing of Equipment

Procedures for removing chemically resistant suit/SCBA ensembles must be developed and followed precisely to prevent the spread of contaminants from the work area to the wearer's body, and to decontamination personnel. Doffing should be performed in concert with the decontamination of the suited worker. Throughout the doffing procedure, both the worker and decontamination personnel should avoid direct contact with the outside surface of the suit.

7.4.7 Inspection

An effective PPE program will consist of three different inspections:

1. Inspection of equipment as it is issued to workers.
2. Inspection after use in training.
3. Periodic inspection of stored equipment.

Each inspection will cover different areas in varying degrees of detail. Explicit inspection procedures are usually available from the manufacturer. It is the responsibility of the field worker to inspect the integrity of his or her equipment before use on a site.

Records must be maintained of all inspection procedures. Identification numbers should be assigned to all reusable pieces of equipment (ID numbers) and records should be kept by that number. As a minimum, each inspection should record the ID number, date, inspector, findings, and any future actions to be taken. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a high level of down time.

7.4.8 Storage

Clothing and respirators must be properly stored to prevent damage or malfunction due to exposure to dust, moisture, sunlight, temperature extremes, and impact. Procedures should be developed for pre issuance warehousing and post issuance (in use) storage. Improper storage can cause equipment failures.

7.5 Protection Levels

7.5.1 Level A

Level A protection should be used when percutaneous hazards exist or where there is no known data to rule out percutaneous hazards. Because wearing a fully encapsulated suit is physiologically and psychologically stressful, the decision to use this protection must be carefully considered. The following conditions suggest a need for Level A protection.

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or based on the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the intact skin.
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible.
3. Operations must be conducted in confined, poorly ventilated areas and the absence of conditions requiring Level A have not yet been determined.

The following items constitute Level A protection:

1. Pressure-demand, full-face piece, self-contained breathing apparatus (SCBA), or pressure-demand supplied-air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH)
2. Totally-encapsulating chemical-protective suit
3. Coveralls
4. Long underwear*
5. Gloves, outer, chemical resistant
6. Gloves, inner, chemical resistant
7. Boots, chemical-resistant, steel toe and shank
8. Hard hat (under suit)*
9. Disposable protective suit, gloves, and boots (depending on suit construction, may be worn over totally-encapsulating suit)
10. Two-way radios (worn inside encapsulating suit)

Before a fully encapsulated suit can be worn into a hazardous situation the suit must be properly inspected. The following is a checklist for visually inspecting all types of fully encapsulated suits.

1. Spread suit out on flat surface.
2. Examine the following:
    a. Fabric and seams for abrasions, cuts, or holes
    b. Zippers and other connecting devices for proper sealing
    c. Visor for dirt and cracks
    d. Exhaust valves (if applicable) for inhibiting debris and proper functioning
3. If air source is available, seal the suit and inflate it. Check for any leaks on surface and seams using a mild soap solution.
4. Record each suit's inspection, use, and repair status.

*Optional, as applicable

7.5.2 Level B

Level B protection should be worn when the highest level of respiratory protection is necessary, but a lesser level of skin protection is needed. The following conditions constitute a need for Level B protection.

1. Atmospheres with concentrations of known substance greater than protective factors associated with full-face, air-purifying respirators.
2. The atmosphere contains less than 19.5 percent oxygen.
3. Site operations make it highly unlikely that the small, exposed areas of the head or neck will be contacted by splashes of extremely hazardous substances.
4. Type(s) and concentration(s) of vapors in air do not present a cutaneous or percutaneous hazard to the small, unprotected areas of the body.

The following items constitute Level B protection:

1. Pressure-demand, full-face piece, self-contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA (NIOSH approved)
2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket, coveralls, one or two piece chemical splash suit; disposable chemical-resistant overalls)
3. Coveralls*
4. Gloves, outer, chemical-resistant
5. Gloves, inner, chemical-resistant
6. Boots, outer, chemical-resistant, steel toe and shank
7. Boot covers, outer, chemical-resistant (disposable)*
8. Hard hat
9. Two-way radios*
10. Face shield*

*Optional, as applicable

7.5.3 Level C

Level C protection should be worn when the type(s) of airborne substance(s) is measured, and the criteria for using air-purifying respirators are met. The following conditions suggest a need for Level C protection:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin.
2. The types of air contaminants have been identified, concentrations measured, and a canister or cartridge respirator is available that can remove the contaminants.
3. All criteria for the use of air-purifying respirators are met.

The following items constitute Level C protection:

4. Full-face or half-mask, air-purifying canister or cartridge equipped respirators (NIOSH approved)
5. Hooded chemical-resistant clothing (overalls; two-piece, chemical-splash suit; disposal, chemical-resistant overalls)
6. Coveralls*
7. Gloves, outer, chemical-resistant
8. Gloves, inner, chemical-resistant
9. Boots (outer), chemical-resistant, steel toe and shank*
10. Boot covers, outer, chemical-resistant (disposable)*
11. Hard hat*
12. Escape mask*
13. Two-way radios*
14. Face shield*

*Optional, as applicable

7.5.4 Level D

Level D protection should not be worn on any site where respiratory or skin hazard exist. Level D protection should be used when:

1. The atmosphere contains no known hazard.
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

The following items constitute Level D protection:

1. Coveralls
2. Gloves*
3. Boots/shoes, chemical-resistant, steel toe and shank
4. Boots, outer, chemical-resistant (disposable)*
5. Safety glasses or chemical splash goggles*
6. Hard hat*
7. Escape mask*
8. Face shield*

The type of clothing used and the overall level of protection should be reevaluated periodically as information about the site increases and as workers perform different operations. The Project Health and Safety Officer will determine when to upgrade or downgrade the level of protection for site personnel.

Reason to upgrade:

1. Known or suspected presence of dermal hazards
2. Occurrence or likely occurrence of gas or vapor emission
3. Change in work task that will increase contact or potential contact with hazardous materials
4. Request of the individual performing the task

*Optional, as applicable

Reasons to downgrade:

1. New information indicating that the situation is less hazardous than was originally thought.
2. Change in site conditions that decreases the hazard.
3. Change in work task that will reduce contact with hazardous materials.

7.5.5 Safety Equipment

Additional safety equipment should be located in the support zone (discussed in Section 10.0) for use in the event of an emergency. This equipment should be centrally located with respect to the project site and kept free of all obstructions for ease of access. This is a general list of safety equipment to be used at the site.

- Portable fire extinguisher (Type ABC);
- Industrial first aid kit;
- Additional eye and face protection (glasses, goggles, face shields);
- Hearing protection;
- Additional PPE (Tyvek®, over-boots, duct tape, hard hats);
- Decontamination water;
- Drinking water; and
- Spill kit (sorbent pads or equivalent).

7.7 Site-Specific PPE Requirements

All field work performed as part of the source area soil removal will begin in Modified Level D PPE as all anticipated soil removal is non-hazardous. The ERM Site and Safety Officer will determine the appropriate Level D protection to be used during Modified Level D work. If soil or sediment samples must be handled directly by personnel, at a minimum, inner latex gloves shall be used.

*Optional, as applicable

Higher levels of PPE are not anticipated for the investigation; however, an upgrade of protection levels will be completed if conditions warrant as described in Section 7.5.4 or as prescribed in air monitoring requirements as specified in the action level table in Section 8.11.

SECTION 8.0

HEALTH HAZARD ASSESSMENT

8.1 Purpose

OSHA, in 29 CFR Part 1910.120 (h), requires air monitoring to be used to identify and quantify airborne concentrations of hazardous substances. The purpose of this guideline is to establish fundamental air monitoring principles that can be used to evaluate potential risks at a site. Section 8.2 through 8.10 provide general information regarding monitoring, instruments, and training. Section 8.11 provides site-specific monitoring requirements for the Site 15 investigation.

8.2 Guidelines

Various dangers may exist when working at a hazardous waste site. Explosive vapors, oxygen deficient atmospheres, and a variety of toxic gases and vapors can be encountered with lethal properties.

When first approaching a waste site, the potential hazards must be recognized and exposure risks evaluated. This can be done by a methodical initial site survey. To perform initial site surveys and subsequent monitoring, various portable instruments must be available. The following sections describe the types of air monitoring that can be performed and how to interpret monitoring results.

8.3 Initial Site Survey Air Monitoring

Site surveys provide the information needed to identify potential site hazards and to select worker respiratory protection methods and equipment. Site surveys generally proceed in three phases:

- Conduct off-site characterization before site entry. Gather information away from the site by consulting or inspecting site owner's files, agency personnel and files, former site employees, and other applicable literature and personnel. (The off-site characterization effort has been completed for Hancock Site 15.) Conduct a reconnaissance from the site perimeter.

- Next, conduct onsite surveys. During this phase, restrict site entry to reconnaissance personnel.
- Once the site has been determined safe for beginning other activities, perform ongoing monitoring to provide a continuous source of information about site conditions.

It is important to recognize that site characterization is a continuous process. At each phase of site characterization, information shall be obtained and evaluated to define the potential hazards of the site.

The following information (to the extent it is available) shall be obtained before perimeter reconnaissance or initial site entry:

- Location and approximate size of the site;
- Description of the response activity or the job task to be performed;
- Duration of the planned employee activity;
- Site topography;
- Meteorologic data such as prevailing wind direction, precipitation levels, and temperature profiles;
- Site accessibility by air and roads;
- Pathways for hazardous substance dispersion;
- Present status and capabilities of emergency response teams (including contact names and phone numbers) that would provide emergency assistance to onsite employees;
- Hazardous substances and health hazards present or expected at the site and their chemical and physical properties; and
- All suspected conditions that may pose inhalation or skin absorption hazards that are immediately dangerous to life or health (IDLH) or other conditions that may cause death or serious harm shall be identified during the preliminary site characterization and carefully evaluated during the initial site entry and subsequent site surveys.

8.3.1 Perimeter Reconnaissance

Following the data-gathering exercise, and at a site where the hazards are largely unknown, a perimeter reconnaissance should be conducted. Reconnaissance personnel should use Level D or C protection as appropriate. Portable air monitoring instruments should be used, particularly when working downwind of the site. The perimeter reconnaissance should be conducted by at least two individuals. The Project Health and Safety Coordinator should be present. The perimeter reconnaissance should involve the following actions:

- Develop a preliminary site map and review available aerial photography;
- Note any labels, markings, or placards on containers or vehicles;
- Note the amount of deterioration or damage of containers;
- Note any biological indicators, such as dead animals or plants;
- Note any unusual conditions such as clouds or vapors, discolored liquids, or soil staining;
- Note any unusual odors; and
- Collect and analyze offsite soil, water, or air samples as appropriate.

8.3.2 Initial Site Entry

OSHA requires that an ensemble of PPE shall be selected and used during the initial site entry that will provide protection to a level of exposure below established PELs for known or suspected hazardous substances and other safety and health hazards identified during the preliminary site evaluation (29 CFR Part 1910.120[c]).

In the rare instance when the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site, Level B respiratory protection (SCBA) and appropriate protective clothing shall be used as minimum protection for the initial site entry. Direct reading instruments shall be used for identifying IDLH conditions. If available information indicates that Level B protection is not required for initial site entry, and if respiratory protection is warranted by the potential hazards identified during the initial site investigation, an escape

SCBA of at least five minutes duration shall be carried by each employee or kept at their immediate work station (29 CFR Part 1910.120[c][5]).

The initial site entry team should consist of three persons: two workers who will enter the site and one outside support person, suited in PPE and prepared to enter the site in case of emergency. It is important that the Project Health and Safety Coordinator be present as one of the team members. Entry personnel should:

- Use monitoring instruments to monitor the air for IDLH and other safety or health conditions that may cause death or serious injury;
- Note the types and condition of containers, impoundments, or other storage systems;
- Note the physical condition of the hazardous substances;
- Determine potential pathways for dispersion; and
- Collect air, water, and soil samples.

8.4 Air Monitoring Instruments

Airborne contaminants may pose a significant threat to worker health and safety, and identification and quantification of airborne contaminants is essential for a good health and safety program at a hazardous waste site. Reliable measurements of airborne contaminants are needed for:

- Selecting personal protective equipment;
- Delineating areas where protection is needed;
- Assessing the potential health effects of exposure; and
- Determining the need for specific medical monitoring.

8.4.1 Measuring Instruments

The purpose of air monitoring is to identify and quantify airborne contaminants to determine the level of worker protection needed. Two principal approaches are available for identifying and quantifying airborne contaminants:

- The onsite use of direct reading instruments; and
- Laboratory analysis of air samples obtained by gas sampling bag, filter, sorbent, or wet contaminant collection methods.

8.4.2 Direct Reading Instruments

Direct reading instruments are used for rapid detection of flammable or explosive gases, oxygen deficiency, and specific gases and vapors. The information provided by these instruments must be used to institute appropriate protective measures.

It is important that direct reading instruments be operated by trained individuals who are familiar with the device's operating principles and limitations. At hazardous waste sites where unknown and multiple contaminants are usually the rule, instrument readings should be interpreted conservatively. The following guidelines should be used to facilitate accurate recording and interpretations:

- Calibrate instruments according to the manufacturer's instructions;
- Develop chemical response curves if these are not provided by the instrument manufacturer;
- A reading of zero should be reported as "no instrument response" rather than "clean" because quantities of chemicals may be present that are not detectable by the instrument; and
- The survey should be repeated with several detection systems to maximize the number of chemicals detected.

A description of the direct reading instruments is presented below.

8.4.2.1 Oxygen Deficient Atmospheres

At sites where oxygen depletion or displacement is anticipated, oxygen levels must be monitored by the use of a portable oxygen detector. A typical oxygen detector measures the percent oxygen in the immediate atmosphere using a galvanic cell. Terrain variations in the land and unventilated rooms or areas often do not contain enough oxygen to support life, making these instruments invaluable to response personnel. The normal ambient oxygen concentration is 20.8 percent.

NIOSH requires that if oxygen levels in the ambient air become less than 19.5 percent, supplied air respirators must be worn. Oxygen enriched atmospheres (oxygen greater than 25 percent) increase the potential for fire or explosion; no work or testing should ever be performed under such conditions.

The operation of oxygen detectors depends on the absolute atmospheric pressure. The concentration of natural oxygen (not manufactured or generated oxygen) is a function of the atmospheric pressure at a given altitude.

At sea level, where the weight of the atmosphere is greatest, more oxygen molecules are compressed into a given volume than at higher elevations. As elevation increases, this compression decreases, resulting in fewer oxygen molecules being "squeezed" into a given volume. Consequently, an oxygen indicator calibrated at sea level and operated at an altitude of several thousand feet will falsely indicate an oxygen deficient atmosphere (less than 19.5 percent).

8.4.2.2 Combustible Gases/Vapors

The presence or absence of combustible vapors or gases must be evaluated at a waste site. A typical combustible gas detector determines the concentration of combustible vapors and gases present in an atmosphere. The level is recorded as a percentage of the lower explosive limit (LEL), which is measured as the change in electrical resistance in a wheatstone bridge circuit.

The LEL of a combustible gas or vapor is the lowest concentration by volume in air that will explode, ignite, or burn when there is an available ignition source. NIOSH has established the following guidelines concerning working in an explosive environment:

1. If combustible gas is detected between 10 to 25 percent LEL, work activities in the area should be limited to those that do not generate sparks.

2. If the explosivity reading on the combustible gas indicator is above 25 percent, operations will stop and the onsite area must be immediately evacuated until appropriate action can be taken to eliminate the hazard.

Once a site has been evacuated, onsite activities cannot resume until project contractor personnel have consulted with personnel experienced in fire or explosion hazards. Onsite activities around enclosed spaces and material containers should be carefully monitored for the presence of combustible gases and vapors. Around well drilling and welding operations, the air above the borehole and around the work area also needs to be monitored for combustible/explosive gases and vapors.

The combustible gas detector cannot be used to test the vapors of leaded gasoline, halogens, and sulfur compounds. These substances interfere with the filament unit, reducing the instrument's sensitivity. Compounds containing silicone will also destroy the platinum filament.

The combustible gas detector can only be used in normal atmospheres, not oxygen-enriched or -deficient. Oxygen concentrations that are less than or greater than normal may cause erroneous readings.

8.4.2.3 Organic Vapor/Gases

The initial survey of a site should always include measurements for organic vapors. Sufficient data should be obtained during the initial entry to screen the site for various levels of organic vapors. These gross measurements can be used on a preliminary basis to (1) determine levels of personnel protection, (2) establish site work zones, and (3) select candidate areas for more thorough qualitative and quantitative studies.

Organic vapor concentrations at a site can be determined by the use of a photoionization detector (PID) or a flame-ionization detector (FID).

Photoionization Detector. Photoionization instruments (HNU® for example) use an ultraviolet (UV) light to ionize chemical compounds. The photoionization process can be illustrated as:

$$RH + hv \quad > \quad RH+ + e$$

where: RH is an organic or inorganic molecule and hv represents a photon of UV light.

The photon has energy equal to or greater than the molecules ionization potential and causes the emission of an electron, "e ".

The PID consists of a chamber containing a pair of electrodes. When a positive potential is applied to one electrode, the field created drives any ions formed by the absorption of UV light to the collector electrode, where the current (proportional to the concentration) is measured.

Compounds with high ionization potentials will not be detected if the lamp used does not have the sufficient energy required to ionize the compound (HNU® manufactures three UV lamps with different ionization energies).

The response to a gas or vapor may radically change when the gas or vapor is mixed with other materials. As an example, a PID calibrated to ammonia and surveying an atmosphere containing 100 ppm ammonia would indicate 100 on the meter. Likewise, an instrument calibrated to benzene would record 100 in an atmosphere containing 100 ppm benzene. However, in an atmosphere containing 100 ppm of each compound, the instrument could indicate considerably less or more than 200 ppm, depending on how it was calibrated.

Flame Ionization Detector. The flame ionization detector (FID) uses ionization as the detection method much the same as in the PID, except that the ionization is caused by a hydrogen flame, rather than UV light. The flame has enough energy to ionize any organic molecule with an ionization potential of 15.4 ev or less.

Inside the instrument's detection chamber, the sample is exposed to a hydrogen flame that ionizes the organic vapors. As the organic vapors burn, positively charged, carbon-containing ions are produced and collect on a negatively charged electrode. As the positive ions accumulate, a current proportional to the hydrocarbon concentration is generated on the input electrode.

Flame ionization detectors do not detect inorganic gases and vapors and many synthetic compounds. Similar to the PID, the FID responds differently to different compounds. For example, an FID that has been calibrated to methane will read 100 ppm methane in an atmosphere containing 100 ppm methane. However, this instrument may only register 10 ppm of carbon tetrachloride in an atmosphere actually containing 100 ppm of that compound. The relative sensitivity to various compounds must be considered when using this instrument.

Colorimetric Indicator Tubes. Often, while evaluating a hazardous waste site, the need arises to quickly measure a specific gas. Direct reading colorimetric indicator tubes can successfully fill that need. These tubes are usually calibrated in parts per million (ppm) or percent concentration for easy interpretation.

Colorimetric indicator tubes consist of a glass tube impregnated with an indicator chemical. A known volume of contaminated air is drawn through the tube at a predetermined rate. The contaminant reacts with the indicator chemical in the tube, producing a discoloration that is proportional to the chemical's concentration. Detector tubes are chemical specific and must be selected before leaving for the site.

Several indicator chemicals may be able to measure the concentration of a particular gas or vapor. Each chemical operates on a different chemical principle and is affected in varying degrees by temperature, air volume pulled through the tube, and interference from other gases or vapors. A "true" concentration versus the "measured" concentration may vary considerably among and between tube manufacturers.

A major limitation of this apparatus involves the process by which the operator "reads" the endpoint. The jagged edge where contaminant meets indicator chemical makes it difficult to get accurate results from this seemingly simple test. However, a diligent and experienced operator should be able to accurately read the endpoint.

8.5 Personal Monitoring

Selective monitoring of high risk workers (i.e., those closest to the source of contamination generation) is recommended during cleanup activities. This methodology is based on the rationale that the probability of significant exposure varies with distance from the source. If workers closest to the source of contamination are not significantly exposed, then all other workers are supposedly not exposed and do not need to be monitored.

Personal monitoring samples should be collected in the breathing zone. These samples represent the inhalation exposure of workers who are not wearing respiratory protection. "Full shift" or 8 hour air samples are analyzed in a laboratory. Full shift air samples may be collected using passive dosimeters, or by a pump that draws air onto a sorbent or filter. It is best to use pumps that maintain a constant flow rate to collect samples, because it is difficult to adjust the pump with protective equipment on.

8.6 Periodic Monitoring

The monitoring surveys made during the initial site entry phase are for a preliminary evaluation of atmospheric hazards. In some situations, the information obtained may be sufficient to preclude additional monitoring.

However, because site activities and weather conditions change during the course of a day, a program to periodically monitor atmospheric changes must be implemented. At a minimum, periodic monitoring of air quality during drilling sampling will be conducted every 15 minutes.

8.7 Training

It is imperative that personnel using monitoring instruments be thoroughly familiar with their use, limitations, and operating characteristics. All instruments have inherent constraints in their ability to detect and/or quantify the hazard for which they were designed. Unless trained personnel use the instruments properly and accurately assess the data readout, air hazards can be grossly misinterpreted, endangering the health and safety of field personnel.

8.8 Instrument Sensitivity

Although the measurement of total vapor/gas concentrations can be a useful adjunct to professional judgment in the selection of an appropriate level of protection, caution should be used in the interpretation of the readout of the measuring instrument. The response of an instrument to a gas or vapor cloud containing two or more substances does not provide the same sensitivity as measurements involving the individual, pure constituents. Hence, the instrument readout may overestimate or underestimate the concentration of an unknown composite cloud. This same type of inaccuracy could also occur in measuring a single unknown substance with the instrument calibrated to a different substance. The idiosyncrasies of each instrument must be considered in conjunction with the other parameters in selecting the protection equipment needed. Using the total vapor/gas concentration to determine levels of protection should provide protection against concentrations greater than the readout of the instrument However, when the upper limits of Levels C and B are approached, serious consideration should be given to selecting a higher level of protection. Cloud constituents must be identified as rapidly as possible and levels of protection based on the toxic properties of the specific substances identified.

8.9 Heat Stress Monitoring

Sweating does not cool the body unless moisture is removed from the body. The use of PPE reduces the body's ability to eliminate large quantities of heat because the evaporation of sweat is decreased. The body's effort to maintain an acceptable temperature may become impaired and this may cause heat stress. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

Heat related problems include heat rash, fainting, heat cramps, heat exhaustion and heat stroke. Heat rash occurs because sweat isn't evaporating, making the skin wet most of the time. Standing erect and immobile in the heat allows blood to pool in the lower extremities. As a result, blood does not return to the heart to be pumped back to the brain and fainting may occur. Heat cramps are painful spasms of the muscles due to excessive salt loss from profuse sweating. Heat exhaustion occurs due to the large fluid and salt loss from profuse sweating. A person's skin is clammy and moist. Nausea, dizziness and headache may also be exhibited.

Heat stroke occurs when the body's temperature regulatory system has failed. Skin is hot, dry red, and spotted. The affected person may be mentally confused and delirious, and convulsions may occur. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area immediately. The person should be soaked with water and fanned to promote evaporation. Medical attention should be obtained immediately. Early recognition and treatment of heat stroke are the only means of preventing brain damage or death.

Monitoring of personnel wearing PPE should commence when the ambient temperature is 70°F or above. Monitoring frequency should increase as the ambient temperature increases or as slow recovery rates are observed. Heat stress monitoring should be performed by a person with a current first aid certification who is trained to recognize heat stress symptoms. For monitoring the body's recuperative abilities to excessive heat, one or more of the following techniques should be used. Other methods for determining heat stress monitoring, such as the wet bulb globe temperature (WBGT) index from American Conference of Governmental Industrial Hygienist (ACGIH) threshold limit value (TLV) booklet can be used.

8.9.1 Early Symptoms of Heat Related Problems

1. Decline in task performance;
2. Incoordination;
3. Decline in alertness;
4. Unsteady walk;
5. Excessive fatigue;
6. Muscle cramps; or
7. Dizziness.

8.9.2 Susceptibility to Heat Stress Increases

The following conditions may make one susceptible to heat stress:

1. Lack of physical fitness;
2. Lack of acclimatization to the ambient temperature;
3. Increased age;
4. Dehydration;
5. Obesity;
6. Drug or alcohol use;
7. Sunburn; or
8. Infection.

To monitor the worker, measure:

- Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period;
  - If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.

  - If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third.

- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).
  - If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.
  - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third.
  - Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

8.9.3 Prevention of Heat Stress

Proper training and preventive measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particu¬larly important because once a person suffers from heat stroke or heat exhaus¬tion, that person may be predisposed to additional heat related illness. To avoid heat stress the following steps should be taken:

- Adjust work schedules;
  - Modify work/rest schedules according to monitoring requirements.
  - Mandate work slowdowns as needed.
  - Perform work during cooler hours of the day, if possible, or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods;
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs,

encourage the worker to drink more. The following strategies may be useful:

  - Maintain water temperature at 50°-60°F (10°-16.6°C).
  - Provide small disposable cups that hold about four ounces (0.1 liter).
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.

- Train workers to recognize the symptoms of heat-related illnesses;
- Rotate personnel and alternate job functions; and
- Avoid double shifts and/or overtime.

8.10 Cold Stress Monitoring

Exposure to low temperatures presents a risk to employee safety and health both through the direct effect of the low temperature on the body and collateral effects such as slipping on ice, decreased dexterity and reduced dependability of equipment. All personnel must exercise increased care when working in a cold environment to prevent accidents that may result from the cold. The symptoms of cold exposure include frostbite and hypothermia. Wind increases the impact of cold on a person's body.

Frostbite is both a general and a medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are: a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid. Superficial frostbite occurs when the skin is white but the underlying tissue is firm. The skin will return to shape when depressed. Deep frostbite causes the underlying tissues to freeze. The skin will either not depress when pressed by the finger or it will depress but not return to the original contour. Deep frostbite is a serious injury.

Hypothermia is defined as a decrease in a person's core temperature below 96°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interferences with any of these mechanisms can result in hypothermia, even in the absence of "cold" ambient temperatures. The first symptom of systemic hypothermia is shivering. Maximum shivering starts when the core body temperature drops below 95°F. The next set of symptoms as the body's cooling progresses is apathy, listlessness, and sleepiness. The person remains conscious and responsive with normal blood pressure and a core temperature of 93.2°F. The person must be immediately removed to a facility with heat. As hypothermia advances beyond this point, the person has a glassy stare, slow pulse, slow respiratory rate and may lose consciousness. Severe hypothermia starts when the core body temperature reaches 91.4°F. Finally, the extremities start to freeze hard and death could result.

8.10.1 Prevention of Cold-Related Illnesses

- Educate worker to recognize the symptoms of frostbite and hypothermia;
- Identify and limit known risk factors;
    - Prohibit phenothiazine (a sedative) use.
    - Identify/warn/limit beta blocker use.
- Assure the availability of an enclosed, heated environment on or adjacent to the site;
- Assure the availability of dry changes of clothes;
- Develop capability for temperature recording at the site; and
- Assure the availability of warm drinks.

8.10.2 Monitoring

Start (oral) temperature recording at the job site:

- At the Field Team Leader's discretion when suspicion is based on changes in worker's performance or mental status;
- At worker's request;
- As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20°F, or wind-chill less than 30°F with precipitation); and
- As a screening measure whenever any one worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 92°F) cannot return to work for 48 hours.

8.11 Site-Specific Risk Analysis

8.11.1 Chemical Hazards

All intrusive activities at Site 15 property should be considered to have potentially impacted soil. The primary chemical hazards have been identified in Section 5.0. These compounds are most likely to have adverse effects if encountered in a significant quantity during field activities.

In addition, the residual treatment during the pilot test operations will be an engineered calcium peroxide (CaO2). The CaO2 reaction with water (H2O) is as follows:

$$CaO2 + 2\ H2O \rightarrow H2O2 + Ca(OH)2$$

$$2\ H2O2 \rightarrow O2 + 2\ H2O$$

For every mole of CaO2 mixed with two moles of water, a mole of oxygen (O2) and a mole of calcium hydroxide (Ca(OH)2) are produced. A typical Material Safety Data Sheet is presented in Attachment A. Storage and handling of this type of material will be performed as discussed in Attachment A.

STORAGE: Keep material dry. Store in a clean cool place. Do not store near or expose to heat sources i.e., steam pipes, radiant heaters, hot hair vents or welding sparks. Avoid contact with reducing agents. Reacts with moisture. Keep container tightly closed when not in use.

HANDLING: Avoid contact by using personal protective equipment. Use respiratory protective equipment when release of airborne dust is expected Do not mix with organics or combustible materials.

PERSONAL PROTECTIVE EQUIPMENT:

EYES AND FACE: Chemical goggles or face shield.

RESPIRATORY: Use approved dust respirator with full face piece.

GLOVES: Rubber or neoprene gloves. Thoroughly wash the outside of gloves with soap and water prior to removal. Inspect regularly for leaks.

PROTECTIVE CLOTHING: Long sleeve shirt, impervious apron or clothing.

Rubber or neoprene footwear.

ENGINEERING CONTROLS: Provide mechanical local exhaust ventilation to prevent release of dust into the work area. If release is expected use respiratory protection.

COMMENTS: VENTILATION: Provide mechanical general and/or local exhaust ventilation to prevent release of dust into work environment. If ventilation is inadequate or not available, use dust respirator and eye protection.

8.11.1.2 *Direct Contact*

Level D personal protective equipment, will be used by all personnel in areas potentially impacted by past activities. Level D equipment will require steel toed rubber boots, or boot covers that prevent contamination of steel toed boots. Nitrile outer and latex inner gloves should provide adequate protection from direct contact hazards.

8.11.1.3 *Volatile Compounds (Vapor Pressure >10 mm Hg)*

Of the listed volatile chemicals, benzene has the lowest PEL as set by OSHA and hence sets the action limit for monitoring with a PID. For any activities taking place in areas of potential site contaminants, continuous measurements shall be taken in the breathing zone with a PID equipped with a 10.6 eV lamp.

Background PID levels should be taken initially upwind from planned site activities. If, during site activities, PID readings reach 5 ppm above background levels in the breathing zone (and are sustained for 15 minutes), then all personnel must upgrade to Level C personal protective gear. Upon upgrading to Level C, a Draeger benzene 2/a color detector tube (part number 8101231) should be used to verify the absence of benzene. If benzene is greater than 5 ppm, all personnel must upgrade to Level B or retreat until air monitoring shows that concentrations have fallen below 5 ppm so that work may continue in a lower level of protection.

Furthermore, if PID readings reach 25 ppm above background (sustained for 15 minutes), then personnel should retreat and consult the Parsons Health and Safety Officer before deciding to upgrade to Level B equipment.

An upper limit of 5 ppm for PID readings for Level D work is specified in this health and safety plan. It is our experience that this upper limit will prevent over-exposures to benzene. Due to the calibration to isobutylene, the Photovac MicroTIP 2000 PID benzene response will be twice as high as the actual benzene concentrations. Thus, a pure benzene vapor of 2.5 ppm will cause the PID to read 5 ppm. Furthermore, based on experience at other sites, detectable levels of total organic vapors typically consist of other volatile constituents such as xylene, toluene and ethyl benzene in addition to benzene. The PID will detect the sum total of these volatiles.

When 5 ppm is reached on the PID response, actual benzene levels should remain below occupational limit values. To verify that this is the case, workers are to use the specified Draeger tube to check for the presence of benzene. It is our experience that Draeger tube screening with the 2/a benzene tube has not shown measurable levels of benzene in worker breathing zones or downwind from drilling areas when PID readings have reached 5 ppm. The Draeger benzene 2/a tube is specified for this use as it is the only Draeger-manufactured tube which does not respond positively to the presence of ethyl benzene, toluene or xylenes vapors. The 2/a tube has a limit of detection of 2 ppm.

8.11.2 Summary of Work Area Action Levels

Based on a review of the potential chemical hazards at the site, the following conditions will determine the level of protective equipment that will be used by personnel while on-site:

Conditions for Level D: - All areas

PID readings < 5 ppm.

Conditions for Level C: - All areas

- PID readings > 5 ppm and < 25 ppm, and
- Draeger™ benzene 2/a tube readings < 2 ppm, or
- Any visible fugitive dust emissions from site activities that disturb contaminated soil.

Conditions for Level B (or retreat): - All areas

- PID readings > 25 ppm, or
- Draeger™ benzene 2/a Tube readings > 2 ppm.

SECTION 9.0

SITE PREPARATION, ZONES, AND SECURITY

9.1 Purpose

OSHA requires (29 CFR Part 1910.120[d]) that a site control program be developed before the initiation of hazardous waste operations. The purpose of this guideline is to establish site control principles that will minimize potential contamination for contractor personnel and protect the public from the site's hazards.

9.2 Guidelines

The activities required during hazardous waste operations involve the movement of materials (contaminants) from the site to unaffected areas. Contractor personnel and equipment may become contaminated and carry the materials into clean areas. Contaminants may become airborne because of their volatility, or the disturbance of contaminated soil may cause it to become wind blown. Contamination control procedures are needed and will reduce the transfer of hazardous substances from the site.

Several site control procedures can be implemented to reduce worker and public exposure to chemical, biologic, physical, and safety hazards:

- Compile a site map;
- Establish work zones;
- Use the buddy system when necessary;
- Establish and strictly enforce decontamination procedures for both personnel and equipment (see Section 10.0);
- Establish site security measures as needed;
- Set up communication networks;

- Enforce safe work practices;
- When contaminants other than those previously identified are handled;
- When different operations are begun;
- When employees are handling leaking drums or working with obvious liquid contamination;
- When weather conditions change; and
- Field operations are to be conducted with a minimum of two persons on site. For operations requiring Level B personal protective equipment a minimum of three people will be required.

9.3 Site Work Zones

One method of preventing or reducing the migration of contamination is to delineate zones on the site where prescribed operations occur. Movement of personnel and equipment between zones and onto the site itself would be limited by access control points. By these means, contamination would be expected to be contained within certain relatively small areas on the site and its potential for spread minimized. Three contiguous zones are recommended. Please note: The Soil Source Area Removal is the removal of non-hazardous petroleum products and the establishment of work zones will only be instituted when Level D Action Levels are exceeded.

9.3.1 Exclusion Zone

The Exclusion Zone is an area where contamination does or could occur. Major activities that are performed in the Exclusion Zone include:

- Site characterization, such as mapping, photographing, and sampling;
- Installation of wells for groundwater monitoring; and
- Cleanup work, such as drum movement, drum staging, and materials bulking.

Everyone entering the Exclusion Zone must wear prescribed levels of protection. An entry and exit check point must be established at the periphery of the Exclusion Zone to regulate the flow of contractor personnel and equipment in and out of the zone and to verify that the procedures established to exit and enter are followed.

The outer boundary of the Exclusion Zone, the Hotline, is initially established by visually surveying the immediate environs of the incident and determining where the hazardous substances involved are located; where any drainage, leachate, or spilled material is; and whether any discolorations are visible. Guidance in determining the boundaries is also provided by data from the initial site survey indicating the presence of organic or inorganic vapors/gases or particulates in air, combustible gases, and radiation, or the results of water and soil sampling.

Additional factors that should be considered include the distances needed to prevent fire or an explosion from affecting contractor personnel outside the zone, the physical area necessary to conduct site operations, and the potential for contaminants to be blown from the area. Once the Hotline has been determined, it should be physically secured, fenced, or well defined by landmarks. During subsequent site operations, the boundary may be modified and adjusted as more information becomes available.

9.3.2 Contamination Reduction Zone

The Contamination Reduction Zone (CRZ) is located between the contaminated area and clean area. This zone is designed to reduce the probability that the clean Support Zone will become contaminated and/or affected by other hazards on site. The distance between the Exclusion Zone and Support Zone provided by the CRZ, together with decontamination of workers and equipment, limits the physical transfer of hazardous chemicals into clean areas. The degree of contamination in the CRZ decreases as one moves from the Exclusion Zone to Support Zone because of the distance and the decontamination procedures.

The boundary between the Support Zone and the CRZ, the Contamination Control Line, separates the possibly low contamination area from the clean Support Zone. Access to the CRZ from the Support Zone is through a control point. Contractor personnel entering through the control point must wear the prescribed PPE, for working in the CRZ. Entering the Support Zone requires removal of any protective equipment worn in the CRZ.

9.3.3 Support Zone

The Support Zone, the outermost part of the site, is considered noncontaminated or clean area. The Support Zone is the location of the administrative and other support functions necessary to maintain smooth operations in the Exclusion Zone and CRZ. Contractor personnel may wear normal work clothes in this area. Any potentially contaminated equipment or clothing must be decontaminated before entry into this area.

The location of the Support Zone depends on a number of factors including:

- Accessibility: topography; open space available; locations of highways, railroad tracks; or other limitations;
- Wind direction: preferably the support facilities should be located upwind of the Exclusion Zone. However, shifts in wind direction and other conditions may be such that an ideal location based on wind direction along does not exist; and
- Resources: adequate roads, power lines, water, and shelter.

9.4 Site Security

Site security at a hazardous waste site is necessary to:

- Prevent the exposure of unauthorized, unprotected people to the site hazards;
- Prevent theft; and
- Avoid interference with safe working procedures.

During the work day, site security can consist of:

- Assign responsibility for enforcing authority for entry and exit requirements;
- Maintain security in the Support Zone and at Access Control Points;
- If the site is not fenced, post signs around the perimeter; and

- Have the Field Team Leader approve all visitors to the site. Make sure they have a valid purpose for entering the site. Have trained site personnel accompany visitors at all times.

During off duty hours, site security can consist of:

- If needed, use security guards to patrol the site boundary. Guards must be fully apprised of the hazards at the site; and

- Secure the equipment.

9.5 Site Communication

Two communication systems should be established during hazardous waste operations; an internal communication among contractor personnel on site, and an external communication between onsite and off site contractor personnel.

Internal communication at site is used to:

- Alert personnel to emergencies;

- Convey safety information (e.g., amount of time left in air tanks, heat stress check, etc.);

- Communicate changes in the work to be performed; and

- Maintain site control.

Often at a site, communications can be impeded by background noise and the use of PPE. For communications to be effective, commands must be prearranged. In addition, audio or visual cues can aid in conveying the message. Some common internal communication devices are: two way radios, noisemakers (e.g., bells, whistles, compressed air horns, etc.), and visual signals (e.g., flags, hand signals, and lights). Radios used in the Exclusion Zone must be intrinsically safe and not capable of sparking.

An external communication system between onsite and off site contractor personnel is necessary to:

- Report to management;

- Coordinate emergency response; and

- Maintain contact with essential off site contractor personnel.

The primary means of external communication is the telephone. If a telephone is not present at the site, all team members must know where the nearest phone is located. The correct change and necessary phone number should be readily available.

9.6 Safe Work Practices

To ensure a strong safety awareness during hazardous waste operations, a list of standing orders stating the practices that may never occur in contaminated areas should be developed. Sample standing orders for contractor personnel entering an Exclusion Zone may include:

- No smoking, eating, drinking, or application of cosmetics in this zone;
- No matches or lighters in this zone;
- Check in at the entrance Access Control Point before you enter this zone;
- Check out at the exit Access Control Point before you leave this zone;
- Always have your buddy with you in this zone;
- Wear an air purifying respirator in this zone; and
- If you discover any signs of radioactivity, explosivity, or unusual conditions such as dead animals at the site, exit immediately and report this finding to your supervisor.

Standing orders should be posted conspicuously at the site. In addition to standing orders, contractor personnel should be briefed on the chemical information of the site contaminant at the beginning of the project. Daily site safety meetings should be held for field team members and any other site contractor personnel.

Working with tools and heavy equipment is a major hazard at sites. Injuries can result from equipment hitting personnel, impacts from flying objects, burns from hot objectives, and damage to protective equipment such as supplied air respirator systems. The following precautions will help prevent injuries because of such hazards:

- Keep all heavy equipment that is used in the Exclusion Zone in that zone until the job is done. Completely decontaminate such equipment before moving it into the clean zone;
- Train personnel in proper operating procedures;
- Install appropriate equipment guards and engineering controls on tools and equipment;
- Where portable electric tools and appliances can be used (i.e., where there is no potential for flammable or explosive conditions), use three wire grounded extension cords to prevent electric shocks;
- Keep all non essential people out of the work area;
- Prohibit loose fitting clothing around moving machinery;
- Do not exceed the rated load capacity of a vehicle; and
- Do not operate cranes or derricks within 10 feet of power lines.

SECTION 10.0

DECONTAMINATION PROCEDURES

10.1 Purpose

To establish fundamental decontamination principles to be used as a guide on developing site and activity specific decontamination procedures.

10.2 Guidelines

Contractor personnel responding to hazardous substance incidents may become contaminated during the course of their work at a site. Protective clothing and respirators help to prevent the wearer from becoming contaminated or inhaling contaminants. Good work practices help reduce the contamination of protective clothing, instruments, and equipment. Even with these safeguards, contamination may occur. Harmful materials can be transferred into clean areas, exposing unprotected personnel. In removing contaminated clothing, personnel may come into direct contact with and/or inhale contaminants. To prevent such occurrences, contamination reduction and decontamination procedures must be developed and implemented. Such procedures are to be in place before anyone enters a hazardous area and must continue (modified if necessary) throughout the period of operation.

Decontamination consists of physically removing contaminants and/or converting them chemically into innocuous substances. The extent of decontamination depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant, the more extensive and thorough the decontamination required. Combining decontamination, the correct donning of protective equipment, and the zoning of site work areas minimizes the possibility of cross-contamination from protective clothing to wearer, or from equipment to workers. Only general guidance can be given on methods and techniques for decontamination. The exact procedure is determined by evaluating several factors specific to the site.

10.3 Initial Planning

The initial decontamination plan is based on the assumption that all contractor personnel and equipment leaving the Exclusion Zone (area of potential contamination) are grossly contaminated. The plan includes a system for washing and rinsing, at least once, all of the protective equipment worn. The washing and rinsing are done in combination with a sequential doffing of clothing, starting at the first station with the most heavily contaminated article and progressing to the last station with the least contaminated article.

10.4 Contamination Avoidance

Contamination avoidance is the best method for preventing the spread of contamination from a hazardous waste site. While planning site operations, methods are to be developed to prevent the contamination of personnel and equipment. Each person involved in site operations must regularly practice the basic methods of site contamination avoidance listed below.

- Know the limitations of all protective equipment being used;
- Do not enter a contaminated area unless it is necessary to carry out a specific objective;
- Avoid touching anything unnecessarily when in a contaminated area;
- Walk around pools of liquids, discolored areas, or any area that shows evidence of possible contamination;
- Walk upwind of contamination, if possible;
- Do not sit or lean against anything in a contaminated area. If you have to kneel (e.g., to take samples), use a plastic ground sheet;
- Before sampling any hazardous waste, read the label and manifest (if available) for all containers to determine the identity of the substance to be sampled and the potential contamination hazard;
- Check for potential incompatibility of wastes while checking for waste contents. These conditions might be caused by heat, fire, or gas; an explosion; the contact of water and alkali metals; violent polymerization; or solubilization of toxic substances. Check waste

containers for evidence of these conditions such as bulged drums, blistered paint, exploded drums, bubbles, dead vegetation, or melted plastic;

- Avoid setting sampling equipment directly on contaminated areas. Place equipment on a protective cover such as a ground cloth; and
- Use the proper tools necessary to safely conduct the study.

Where possible, plan very specific methods to reduce the risk of contamination. Using remote sampling techniques, opening containers by non manual means, bagging monitoring instruments, using drum grapplers, watering down dusty areas, and avoiding areas of obvious contamination reduces the possibility of contamination and precludes elaborate decontamination procedures.

10.5 Site Organization

An area within the CRZ is designated the Contamination Reduction Corridor (CRC). The CRC controls access into and out of the Exclusion Zone and confines personnel decontamination activities to a limited area. The size of the corridor depends on the number of stations in the decontamination procedure, the overall dimension of work controls zones, and the amount of space available at the site. A corridor of 75 feet by 15 feet should be adequate for full decontamination. Whenever possible, it should be a straight path. The CRC boundaries should be conspicuously marked, with entry and exit restricted. The boundary between the Exclusion Zone and the CRZ is referred to as the hotline. Contractor personnel exiting the Exclusion Zone must go through the CRC. Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Within the CRC, distinct areas are set aside for decontamination of personnel, portable field equipment, and clothing. These areas must be marked and restricted to those workers wearing the appropriate protection. All activities within the corridor are confined to decontamination. The level of decontamination must be spelled out in the project health and safety plan.

Protective clothing, respirators, monitoring equipment, sampling supplies, and other equipment are all maintained in a support area outside of the CRC. Contractor personnel don their protective equipment (dressout) away from the CRC and enter the Exclusion Zone through a separate access control point at the hotline.

10.6 Decontamination Guidance

The protection selected for an investigation and the specific pieces of clothing worn in the exclusion zone dictate the items required and layout of the decontamination line. Different degrees of protection present a different situation with respect to the type of decontamination procedure required. Level C and D protection and decontamination procedures are anticipated for Site 15.

The reason for leaving the Exclusion Zone determines the need for and extent of decontamination. Also, the time required for worker decontamination must be determined and incorporated in the scheduling of site activities. A worker leaving the Exclusion Zone to pick up or drop off tools or instruments and immediately returning may not require full decontamination. A worker leaving to get a new air cylinder or change a respirator or canisters, however, would require some degree of decontamination. Contractor personnel wearing self contained breathing apparatuses must leave their work areas with sufficient air to walk to the CRC and go through decontamination. Contractor personnel departing the CRC at break time, lunchtime, or the end of the day must be thoroughly decontaminated.

The type of decontamination equipment, materials, and supplies are generally selected on the basis of availability. The ease of equipment decontamination and disposability are also considered. Most equipment and supplies are easily procured. Soft bristle scrub brushes or long-handle brushes are used to remove contaminants. Buckets of water or garden sprayers are used for rinsing. Large galvanized wash tubs, stock tanks, or children's wading pools can be used as containers for wash and rinse solutions. Large plastic garbage cans or containers lined with plastic bags are useful for the storage of contaminated clothing and equipment, and metal or plastic cans or drums are useful for the storage of contaminated liquids. Other gear includes paper or cloth towels for drying protective clothing and equipment.

Heavy equipment such as bulldozers, trucks, backhoes, and drilling equipment are difficult to decontaminate. The method generally used is to wash them with water under high pressure and scrub accessible parts with detergent/water solution, also under pressure if possible. Particular attention should be given to tires, scoops, and other components that directly contact contaminated areas. Provisions should be made to collect rinsate for treatment or disposal.

Protective equipment is usually decontaminated by scrubbing with detergent water using a soft-bristle brush followed by rinsing with copious amounts of water. While this process may not be fully effective in removing some contaminants (in some instances the contaminants may react with water), it is a relatively safe option compared to the use of a decontaminating solution. The contaminant must be identified before a decontamination chemical is used, and reactions of such a chemical with unidentified substances or mixtures could be especially troublesome.

Sampling devices and tools may require special cleaning depending on the specific contaminants found at the site. General decontamination procedures should typically be followed.

10.7 Extent of Decontamination Required

The project health and safety plan must be adapted to specific conditions. These conditions may require more or less personnel decontamination than was incorporated into the initial plan, depending on the following factors:

- Type of contaminant. The extent of personnel decontamination depends on the effects the contaminants have on the body. Whenever it is known or suspected that personnel can come in contact with highly toxic or skin destructive substances, full decontamination procedures should be followed. If less hazardous materials are involved, the procedure can be downgraded.

- Amount of contamination. The amount of contamination on the protective clothing is usually determined visually. If the clothing is badly contaminated, a thorough decontamination is generally required. Gross materials remaining on the protective clothing for any extended period of time may degrade or permeate it. This likelihood increases with higher air concentrations and greater amounts of liquid contamination. Gross contamination also increases the probability of personnel contact.

- Level of protection. The level of protection and specific pieces of clothing worn determine, on a preliminary basis, the layout of the decontamination line. Each level of protection incorporates different problems in decontamination such as the harness straps and backpack assembly of the self-contained breathing apparatus. A butyl rubber apron worn over the harness makes decontamination easier. Clothing variations and different levels of protection may require adding or deleting stations in the original decontamination procedure.

- Work function. The work each person does determines the potential for contact with hazardous materials. In turn, this dictates the layout of the decontamination line. For example, observers, photographers, operators of air samplers, or others in the Exclusion Zone performing tasks that will not bring them in contact with contaminants may not need to have their garments washed and rinsed. Others in the Exclusion Zone with a potential for direct contact with the hazardous material will require a more thorough decontamination. Different decontamination lines could be set up for different job functions, or certain stations in a line could be omitted for personnel performing certain tasks.

- Location of contamination. Contamination on the upper areas of the protective clothing poses a greater risk to the worker because volatile compounds may generate a hazardous breathing concentration both for the worker and for the decontamination personnel. There is also an increased probability of contact with skin when removing clothing from the upper body.

10.8 Testing the Effectiveness of Decontamination

Decontamination methods vary in their effectiveness for removing chemicals. The decontamination method chosen for a site should be assessed at the beginning of the program and periodically throughout the program by the Project Health and Safety Manager. If contaminants are not being removed or are permeating protective clothing, the decontamination program should be changed. The following methods may be useful in assessing the effectiveness of decontamination:

- Natural light. Discolorations, stains, corrosive effects, visible dirt, or alterations in clothing fabric may indicate that contaminants have not been removed. Not all contaminants leave visible traces; many contaminants can permeate clothing and are not easily observed.

- Ultraviolet light. Certain contaminants, such as polycyclic aromatic hydrocarbons, which are common in many refined oils and solvent wastes, fluoresce and can be visually detected when exposed to ultraviolet light. Ultraviolet light can be used to observe contamination of skin, clothing, and equipment. However, the use of ultraviolet light can increase the risk of skin cancer and eye damage; therefore, a qualified health professional should assess the benefits and risks associated with ultraviolet light before its use at a waste site.

- Photoionization detector. A photoionization detector can be used to determine the effectiveness of the decontamination procedure in removing many volatile organic compound. However, this method would be ineffective in determining the extent of residual pesticides or metal on personal protective equipment because these substances are not volatile.

- Wipe testing. This method provides after the fact information on the effectiveness of decontamination. In this procedure, a dry or wet cloth, glass fiber filter paper, or swab is wiped over the surface of a contaminated object and then analyzed in a laboratory. Both the inner and outer surfaces of protective clothing should be tested. Skin may also be tested using wipe samples.

10.9 Decontamination during Medical Emergencies

The project health and safety plan should establish methods for decontaminating personnel with medical problems and injuries. It is possible that decontamination may aggravate or cause more serious health effects. If prompt life saving first aid and medical treatment is required, decontamination procedures should be omitted. Whenever possible, response personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination.

10.9.1 Physical Injury

Physical injuries can range from a sprained ankle to a compound fracture, from a minor cut to massive bleeding. Depending on the seriousness of the injury, treatment may be given at the site by trained response personnel. For more serious injuries, additional assistance may be required at the site or the victim may have to be transported to a medical facility.

Life-saving care should be started immediately, without considering decontamination. The outside garments can be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Respirators and backpack assemblies must always be removed. Fully encapsulating suits or chemical resistant clothing can be cut away. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating medical personnel and the inside of ambulances. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim at the site. One exception would be if it is known that the individual has been contaminated with an extremely toxic or corrosive material that could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

10.9.2 Heat Stress

Heat-related illnesses range from mild heat fatigue to a serious heat stroke. Heat stroke requires prompt treatment to prevent irreversible damage or death. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and treatment begun immediately. Protective clothing may have to be cut off. Less serious stages of heat stress require prompt attention because they can lead to heat stroke.

10.9.3 Chemical Exposure

Exposure to chemicals can be divided into two categories:

1. Injuries from direct contact, such as acid burns or inhalation of toxic chemicals.

2. Potential injury caused by gross contamination on clothing or equipment.

For inhaled contaminants, treatment can only be performed by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substance's effect. First aid treatment generally includes flooding the affected area with water. For a few chemicals, water may cause more severe problems.

When protective clothing is grossly contaminated, contaminants may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed.

10.10 Closure of the CRC

When the CRC is no longer needed, it must be closed down by the operators. All disposable clothing and plastic sheeting used during the operation must be double-bagged and either contained on site or removed to an approved off site disposal facility. Decontamination and rinse solutions should be discarded on site if approved by regulatory agencies or it must be removed to an approved disposal facility. Reusable rubber clothing should be dried and prepared for future use (if gross contamination had occurred, additional decontamination of these items may be required). Cloth items must be bagged and removed from the site for final cleaning. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures to hazardous substances. All wash tubs, pails, containers, etc., must be thoroughly washed, rinsed, and dried before removal from the site.

10.11 Necessary Equipment

Based on the expected levels and types of contaminants at the site, modifications to the OSHA-specified modifications, the equipment listed below may be necessary for personnel decontamination.

10.12 Equipment Decontamination

Sampling equipment such as split spoon samplers, probes, and stainless steel bowls and spoons will be decontaminated before each use and at the end of the day. Decontamination procedures include:

- Rinse with potable water;
- Wash with phosphate-free detergent;
- Rinse with potable water;
- Rinse with technical grade methanol;
- Rinse with deionized water; and

- Allow to air dry.

10.13 Drilling Equipment Decontamination

The drilling equipment will be hand-cleaned and sampling equipment will be decontaminated prior to moving offsite. The equipment will be decontaminated in the following manner:

- The drilling equipment will be hand cleaned to remove gross contamination; and

- Equipment will be air-dried.

An drilling hierarchy (from less-likely to more-likely contaminated locations) will be imposed to reduce the potential for cross contamination.

All sampling equipment will be decontaminated prior to use at each sampling location. The sampling equipment will be decontaminated in the following manner:

- The sampling spoon and bowl will be washed with Alconox, rinsed with methanol, and rinsed with deionized water.

SECTION 11.0

RECORDKEEPING

Good record keeping is essential for an effective health and safety program that will meet the needs of the contractor and the requirements of state and federal laws and regulations. The following subsections describe the health and safety records that must be maintained.

11.1 Health and Safety Training Records

Document all formal training of contractor personnel and have these records kept by the Program Health and Safety Manager. Retain these records in the contractor's project health and safety file separate from the normal personnel records.

- Each record of training must contain:
- Name and ID number of the person trained;
- Date of training;
- Content or scope of training provided;
- Names of the trainers; and
- Results of certification test (for 40-hour hazardous waste operations training).

Where it is required, field training (level B, instrumentation training, etc.) will be performed and documented by the Program Health and Safety Manager. These records will then be transferred to the contractor's health and safety files for permanent storage.

When an employee terminates, his or her training records are forwarded to the Corporate Health and Safety Manager. Each employee's training records are maintained during his or her employment with the contractor and for a period of 30 years after termination of employment with contractor.

11.2 Medical Surveillance Records

Two types of medical surveillance records must be kept: (1) The medical reports furnished by the physician to the Program Health and Safety Manager and (2) the clinical records of the employee's past medical history and the results of medical examinations.

11.2.1 Archival Storage of Medical Records

OSHA requires that the employer maintain and preserve medical records on potentially exposed workers for 30 years after they leave employment. The contractor Corporate Health and Safety Manager will maintain the medical surveillance records of terminated employees in a locked file separate from other personnel records. The sealed files shall not be opened by or released to anyone except: (a) on express authorization by the employee - in which case copies of the records will be provided to the employee, (b) on direct order of a court, or (c) by order of an authorized federal or state OSHA representative.

11.2.2 Confidential Information

The physician's opinion report must be treated as confidential information. A separate, locked file is to be maintained for the segregation and storage of these reports. This information can only be made available to the site Health and Safety Coordinator, and the employee. The employee may request to review the medical opinion. The Program Health and Safety Manager will then transfer the physician's statement to the employee. The Program Health and Safety Manager must properly record the transfer of the document. The medical information must be returned to the locked file at the conclusion of each day. Copies of the report cannot be issued to unauthorized personnel or organizations without the employee's written consent. Copies of all confidential information must be sent with an accompanying transmittal form.

11.3 OSHA 200 Form

The contractor is not required by federal law to maintain and post the OSHA No. 200 form (log and summary of occupational injuries and illnesses) because the contractor is classed under S.I.C (Standard Industrial Classification) code 8711, Engineering Services. (Our laboratories would be S.I.C. code 8734.) Under federal law, facilities with S.I.C. codes 87xx are exempt from the reporting requirements. However, several states have their own occupational safety and health programs qualified under federal OSHA. These state program requirements differ in some respects from the federal requirements.

The contractor maintains an up-to-date OSHA 200 log. The Program Health and Safety Manager is responsible for maintaining the log and summary of all occupational injuries and illnesses occurring at the site.

Each injury or illness shall be recorded on the log as soon as practicable (but no later than six working days) after receiving information that an injury or illness has occurred. The OSHA 200 form is recommended for recording of this information.

The OSHA 200 form states that only 'recordable' (as defined on the form) injuries and illnesses be entered. However, all injuries and illnesses should be entered so that we have better information for evaluation of the contractor's health and safety program. Each recordable entry on the OSHA 200 form should be so marked. Injury and illness records shall be kept on a calendar year basis. The OSHA 200 form shall be retained in the contractor's corporate office for five years following the end of the year to which they pertain.

11.4 Audit Reports

A health and safety project audit refers to the auditing of project activities for compliance with the project health and safety plan, applicable contractor health and safety guidelines, and federal and state OSHA requirements. A project specific audit checklist will be developed based on the in the project health and safety plan. An example of areas that will be addressed in an audit checklist for hazardous waste site investigations include:

- Decontamination procedures;
- Air-monitoring procedures;
- Emergency planning;
- Completeness of Site Health and Safety Plan;
- Choice of level of protection;

- Documentation of respirator fit-testing; and
- Documentation of health and safety training.

Audit reports will be prepared by the Program Health and Safety Manager after gathering and evaluating all available data. Items, activities, or documents determined to be deficient shall be identified at the post-audit meeting with the audited team. Deficiencies will be logged, documented, and controlled through Health and Safety Audit Notices that should be attached as part of the audit report. Project audit reports are sent to the Program and Project Manager.

Responses to audit findings must be addressed in a specified and timely manner. The adequacy of the response shall be evaluated by the Program health and Safety Manager. For a response to be considered adequate, it must:

1. Correct the situation that created the deficient conditions.
2. Provide a mechanism for preventing recurrence of the situation.
3. Identify the target date for the completion of these activities.

If the response is satisfactory, this fact will be noted on the Health and Safety Audit Notice form. After all notices have been accepted, the Program Health and Safety Manager will close out the audit report. Copies of the audit report and responses may be distributed to the appropriate levels of management.

11.5 Access to Other Health and Safety Records

The majority of health and safety documents (accident reports, audit reports, etc.) shall be stored and maintained in a file with controlled access. Entry into the file shall be restricted to personnel designated by the Program Health and Safety Manager.

SECTION 12.0

REFERENCES

Aneptek, 1999. *Draft Treatability Study/Technical Memorandum for Petroleum, Oil, and Lubricant Facility, Site 15.* 174th Fighter Wing, New York Air National Guard, Hancock Field, Syracuse, New York. Prepared by Aneptek Corporation for the Air National Guard Readiness Center, Andrews AFB, Maryland. December 1999.

Metcalf & Eddy (M&E), 1995. *Final Technical Memorandum.* 174th Fighter Wing, New York Air National Guard, Hancock Field, Syracuse, New York. Prepared by Metcalf & Eddy for the Air National Guard Readiness Center, Andrews AFB, Maryland. February 1995.

NYSDEC, 2006. Part 375: General Remedial Program Requirements, Environmental Conservation Law (ECL) Article 1, Section 0101; ECL Article 27, Titles 13 and 14; ECL Article 52, Title 3; ECL Article 56, Title 5; ECL Article 71, Title 36; Chapter 577, Laws of 2004 and State Finance Law Article 6, Section 97-B; Effective December 14, 2006.

Parsons, 2004. *Remedial Action Plan for Hancock ANG Site 15.* Parsons Engineering Science, Inc., Liverpool, New York, January 2004.

Parsons Environmental Remediation Project. 1993. *Project Health and Safety Plan.* Fairfield: Parsons Environmental Services, Inc.

APPENDIX A

PERTINENT HEALTH AND SAFETY DOCUMENTS

Incident Investigation Form

FOR ERM MANAGEMENT INTERNAL USE ONLY, CONFIDENTIAL - WITHOUT PREJUDICE REPORT

Instructions: Aim to complete **Part 1 of this form within 24 hours** after the incident and complete **Part 2 within 3 working days** after the incident. In addition to the Project Manager and OpCo Health and Safety Coordinator, who are primarily involved with the investigation, please ensure that the following individuals are made aware of the incident at least verbally within 24 hours and receive the completed incident form as soon as it is completed: **Branch Manager; Corporate H&S Director, OpCo President, and Regional CEO**. Based on the requirements of the company's claims reporting procedure (which shall be updated from time to time), if necessary, the OpCo President will notify the company's Legal Department. The OpCo H&S Coordinator should keep paper or electronic copies of these reports. If a piece of information does not apply, put N/A in the block.

I. INJURY AND ILLNESS DATA AND SUMMARY

Date and time of incident
Date: Time:

Location of incident (Name and address)

Time injured employee started work on day of incident

Weather conditions

Reported by

Date reported

List any witnesses

Project Number

Project Manager

Principal-in-Charge

Injured employee's name

Injured employee's department or practice area

Injured sub-contractor's name

Injured sub-contractor's employer

Injured person's sex
Male ☐ Female ☐

Injured employee's date of hire at ERM

Type of Incident (check one)
☐ First aid/minor injury ☐ All other injuries
☐ Vehicle accident ☐ Property damage ☐ Near miss

What activity/task was taking place just prior to the incident? (Describe the activity/task as well as tools, equipment and material involved that set the stage for the incident. What was the worker doing?)

ERM

What changed about the situation or task to cause the incident? How did the incident happen? (Describe in detail the incident.)

If the incident involved an injury, describe it. (e.g., cut to left ring finger, sprained right ankle, snake bite to left shin, pulled muscles in the lower back)

Immediate actions taken (Describe actions taken and by whom immediately after the incident occurred.)

What object or substance directly harmed the employee? (Examples, concrete floor, chlorine, H2S, manhole cover. If this question does not apply to the incident, write N/A.)

If medical treatment was given away from worksite, state name and mailing address of both the facility and treating health care professional.

Was employee treated in an emergency room? Yes ☐ No ☐	Was employee hospitalized overnight as an in-patient? Yes ☐ No ☐

Additional Consequences of incident (Describe damage to property/equipment, consequences to other employees or community, schedule.)

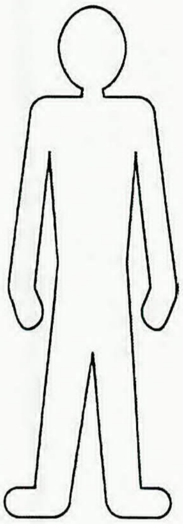
If the employee died, give date of death.

Is the incident recordable/reportable under any governmental requirement? (To be completed by OpCo Health and Safety Coordinator)

Yes ☐ No ☐ Name of person making determination

How many photos of the scene were taken?

(If completed manually) Please note the position of the injury on the diagram and sketch any other instructive diagrams here as well.



Name of person completing form

Signature of person completely form

Title of person completing form

Phone number of person completing form

Date form completed

Instructions: This side of the form will be completed as directed by the OpCo Health and Safety Coordinator

II. CAUSES AND PLANS TO PREVENT RECURRENCE

Actions leading to incident. (Check all that apply and explain.)

☐ Failure to observe warning
☐ Delayed discovery
☐ Other
☐ Failure to use PPE
☐ Procedure not followed
☐ Failure to warn
☐ Abuse/misuse of equipment

Conditions leading to incident. (Check all that apply and explain.)

☐ Temperature/weather
☐ Lack of PPE
☐ Improper design/engineering
☐ Other
☐ Inadequate maintenance
☐ Lack of proper instructions
☐ Improper/defective tools/ equipment
☐ Nature (animal, insects, plants)
☐ Construction deficiencies

Job factors leading to incident. (Check all that apply and explain.)

☐ Leadership/supervision
☐ Inadequate communication
☐ Inadequate work procedures/practices
☐ Other
☐ Work practices
☐ Inadequate training
☐ Defective tools/equipment
☐ Inadequate inspections

Personal factors leading to incident. (Check all that apply and explain.)

☐ Physical capability
☐ Knowledge of task
☐ Other
☐ Physical stress/fatigue
☐ Employee skills
☐ Mental stress
☐ Attention to details

Corrective Actions	Person responsible	Deadline	Date completed
1)	1)	1)	1)
2)	2)	2)	2)
3)	3)	3)	3)
4)	4)	4)	4)

Task Hazard Analysis Worksheet

In assessing the potential hazards, determine if one task description/ analysis is sufficient. If not, then develop additional task assessments with their own steps.

Task Description (Sequence of Steps):

1.
2.
3.
4.
5.
6.

Check Applicable Task Hazard	**Check the Planned or Recommended Hazard Control (write in others)**
☐ Asphyxiation	☐ Ventilation ☐ Supplied Air ☐ Air monitoring
☐ Chemical Exposure	☐ Isolation, Lockout/Tagout ☐ PPE ☐ Respiratory Protection ☐ Decontamination/ eyewash/ shower
☐ Harmful Dust	☐ Dust Suppression ☐ PPE
☐ Thermal Burns ☐ Hot Surface	☐ Splash Guard ☐ Isolation, Lockout/Tagout ☐ PPE ☐ Equipment Covers ☐ Barricades
☐ Slips, Wet Surface	☐ Clean Surface ☐ Barricade ☐ Walk Carefully/ Eyes on Path ☐ Use alternate route
☐ Trips	☐ Relocate the trip hazards ☐ Barricade ☐ Use alternate path
☐ Falls ☐ More than 4 feet	☐ Fall restraint, guardrails, barricades, short lanyard
☐ Electrical shock	☐ Isolation, LOTO ☐ Testing ☐ Grounding ☐ Shielding on equipment ☐ PPE ☐ Ground Fault Interruption on electrical cords ☐ Electrical expertise on project team
☐ Airborne/Flying material	☐ Cover/Shield source ☐ PPE, Eye & Face ☐ PPE, Arms & Body ☐ Positioning
☐ Fire/ Explosion	☐ Isolation/LOTO ☐ Air testing/monitoring ☐ Control sources of ignition ☐ Implement a "Hot Work" process ☐ PPE ☐ The correct fire extinguisher is available
☐ Heat/Cold Stress	☐ Ventilation ☐ Cooling vests, etc. ☐ Task rotation, Shared tasks ☐ Work/Rest regimen ☐ Planned place for sheltering
☐ High Noise	☐ Hearing Protection ☐ Relocate Work ☐ Muffle Source
☐ Poor Visibility	☐ Illumination is adequate for task ☐ Nighttime considerations if the job *could* extend past daylight hours
☐ Lifting, pulling, pushing	☐ A plan is in place (people, devices, carts) ☐ Handling equipment is designed for the job ☐ Proper technique known/ discussed ☐ Smaller, lighter loads? ☐ Prepared for "unexpected release"
☐ Repetitive motion	☐ Proper technique known/ discussed ☐ Proper tools, rather than manual ☐ Get help, take breaks ☐ Seek advice
☐ Rotating equipment	☐ Isolation, LOTO ☐ Guarding, Barricading ☐ No loose clothing ☐ Positioning
☐ Pinch Points	☐ Guarding ☐ Positioning
☐ Sharp objects	☐ Guarding ☐ Gloves, safety shoes or boots ☐ Substitute safe cutter for blade
☐ Falling objects	☐ Secure objects ☐ Guarding, covers ☐ Hard Hat ☐ Barricading
☐ Hazards from others working in vicinity (particularly heavy equipment)	☐ Communication ☐ Barricading ☐ Shielding
☐ Hazards to other working in vicinity	☐ Communication ☐ Barricading ☐ Shielding
☐ Environmental Spill	☐ Containment ☐ Waste Plan ☐ Waste Containers ☐ Other
☐ Chemical Storage	☐ Container labeling and MSDSs ☐ Incompatibles (acids/bases, flammables/oxidizers) considered ☐ Control physical damage to containers
☐ Drowning	☐ Personal Floatation Device ☐ Barricading ☐ Working with a partner ☐ Alerting Devices
☐ Ionizing Radiation	☐ Exposure Monitoring ☐ PPE ☐ Distance and/or shielding
☐ Nearby Road Traffic	☐ Bright colored work vests ☐ Planned avoidance of traffic areas ☐ Signs and lights to alert drivers
☐ Hazards not listed	List of Hazard Controls:

	YES	**NO**	**N/A**
Is a permit (Hot Work, Confined Space Entry, Process Line Breaking, LOTO) required for this ERM work task?			
If so is the client's procedure/policy supplied?			
Do you have the proper tools and/or equipment in good condition			
Have you planned an escape route?			
Was this Hazard Analysis reviewed with the project team performing this task?			

Developed By (Individual or Team Members)
Names:____

Date Developed:____________

Reviewed with the Following Project Employees:

____

____

____

ERM

SUBSURFACE CLEARANCE PROCEDURE **FIELD** CHECKLIST

(Use this sheet to document basic field elements of SSC, and keep with project information)

Site Name/Project No.: ____________________
Walkover Date: ____________________
By (ERM/Client Names): ____________________

(ERM-MANAGED SUBSURFACE CLEARANCE ACTIVITIES)	**Yes**	**No**	**N/A**	Comments
Preparation Tasks	Observed?			
1. The potential for unexploded ordnance (UXO) has been assessed and a UXO survey performed	☐	☐	☐	
2. A site walk-over was conducted and above-ground indicators of underground utilities noted or mapped.	☐	☐	☐	
• Telephone Lines	☐	☐	☐	
• Data lines/cable trench	☐	☐	☐	
• Gas pipes/storage tanks	☐	☐	☐	
• Potable water pipes/fire water (sprinklers) pipes and hydrant lines	☐	☐	☐	
• Sewer lines (storm water/process water)	☐	☐	☐	
• Steam lines (district) and heating lines	☐	☐	☐	
• Fuel oil lines/storage tanks (UST), incl. tankfield fill ports, observation wells, vent stacks	☐	☐	☐	
• Lighting (street and traffic)	☐	☐	☐	
• Other underground utilities	☐	☐	☐	
• Hydrants	☐	☐	☐	
• Non-native soil	☐	☐	☐	
• Warning Tape	☐	☐	☐	
• Manholes	☐	☐	☐	
3. "Critical zone" decisions	☐	☐	☐	
• A mark has been placed on the map to limit surface disturbance within 10 feet of:	☐	☐	☐	
o Tanks, dispenser islands	☐	☐	☐	
o Piping manifolds	☐	☐	☐	
o Pumps/pump galleries	☐	☐	☐	
o Loading racks	☐	☐	☐	
o Process equipment	☐	☐	☐	
o On- or below-grade transformers	☐	☐	☐	
o Compressors				
o Underground chemical lines and high voltage utilities	☐	☐	☐	

Form completed by: ____________________ ____________________
Name Date

ERM HOT WORK PERMIT

ALL TEMPORARY OPERATIONS INVOLVING OPEN FLAMES OR PRODUCING HEAT AND/OR SPARKS REQUIRE A HOT WORK PERMIT. THIS INCLUDES (BUT IS NOT LIMITED TO) WELDING, CUTTING, GRINDING, AND BRAZING.

WARNING!
HOT WORK IN PROGRESS
WATCH FOR FIRE!

DATE: ______________________________ (Permit good for one shift only)

PROJECT NUMBER: ____________________________

WORK TO BEGIN: _______________ AM/PM ENDING AT: ______________

LOCATION: ____

WORK TO BE DONE: ____

____

____

____

WORK TO BE PERFORMED BY: _____________________________________

NAME(S) OF FIRE WATCH: _______________________________________

OTHER SPECIAL PRECAUTIONS TAKEN: ______________________________

____

____

____

SEE REVERSE SIDE

Completed Hot Work Permit must be kept in project file for at least one year

Revision 1 (11/03/2005)

HOT WORK SAFETY CHECKLIST: The person performing the work must complete the checklist below to ensure that the proper safety precautions have been met.

1. Have all flammable or combustible materials been removed from the work area (at least 35 feet)? **YES / NO**
2. For any flammable or combustible materials cannot be removed, have they been properly covered by fire-resistive shields or tarpaulins? **YES / NO**
3. Are fixed fire-extinguishing systems in service (e.g. sprinklers, etc.)? **YES / NO**
4. Are adequate portable fire extinguishers provided? **YES / NO**
5. Has the affected area been cordoned off? **YES / NO**
6. Have wall or floor openings been properly covered? **YES / NO**
7. Is hot work equipment in good working condition? **YES / NO**
8. Fire watch provided during and for 30 minutes after work, including any breaks? **YES / NO**
9. Is hot work to be performed in a confined space (if yes, contact H&S Coordinator)? **YES / NO**

ACKNOWLEDGMENT OF PERSON PERFORMING WORK: I have been instructed and I understand the hazards, as well as the precautions necessary to do this work.

Signature of person performing work *Date & Time*

SITE SAFETY OFFICER VERIFICATION: I verify that the work site has been inspected, all necessary precautions have been taken to prevent fire, and the individual(s) listed on this permit are authorized to perform this work.

Signature of Site Safety Officer *Date & Time*

- -

THIS SECTION TO BE FILLED OUT UPON COMPLETION OF WORK:

FIRE WATCH VERIFICATION: I have monitored the hot work area for at least 30 minutes following completion of the work and find the area to be in safe condition.

Signature of fire watch *Date & Time*

SITE SAFETY OFFICER VERIFICATION: I have inspected the work site at least 30 minutes after completion of the work and find the area to be in safe condition.

Signature of Site Safety Officer *Date & Time*

Completed Hot Work Permit must be kept in project file for at least one year

B

APPENDIX B

ADDENDUM TO THE QUALITY ASSURANCE PROJECT PLAN

Final Quality Assurance Project Plan Supplemental Remedial Investigation/Focused Feasibility Study

174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

Revised August 2010

Air National Guard
Andrews AFB, Maryland

Final Quality Assurance Project Plan Supplemental Remedial Investigation/Focused Feasibility Study

174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

Revised August 2010

Prepared For:

Air National Guard
Andrews AFB, Maryland

Contract No. DAHA92-01-D-005
Delivery Order 0109

ERM®

Prepared By:

Environmental Resources Management
5788 Widewaters Parkway
Dewitt, New York 13214

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF ACRONYMS

Acronym	Definition
ANG	Air National Guard
ASP	Analytical Services Protocol
ASTM	American Society for Testing and Materials
BCG	Brooklawn Golf Course
BEX	Benzene, ethylbenzene and xylene
BSS	Blank Spike Sample
COC	Chain of Custody
DUSR	Data Usability Summary Report
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Approved Program
ERM	Environmental Resource Management
FB	Field Blank
FTL	Field Team Leader
GC	Gas Chromatography
GE	General Electric
HQ ANG PM	Headquarters, Air National Guard Project Manager
IRAWP	Interim Remedial Action Work Plan
LIM	Laboratory Information Management
MS	Mass Spectroscopy
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MTBE	Methyl-tert buthyl-ether
NAPL	Non-aqueous phase liquid
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PARCC	Precision, accuracy, representativeness, completeness and comparability
PD	Project Director
PID	Photo-ionization detector
PM	Project Manager
PPE	Personal Protective Equipment
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan

Acronym	Definition
QC	Quality Control
RamTech	Ram Tech Consulting Corporation
RSD	Relative Standard Deviation
RPD	Relative Percent Difference
SCGs	Standards, Criteria and Guidance documents
SDG	Sample Data Group
SOP	Standard Operating Procedure
SOW	Statement of Work
SRI/FFS	Supplemental Remedial Investigation/Focused Feasibility Study
TANC	TestAmerica North Canton
TB	Trip Blank
TM	Technical Memorandum
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
VTSR	Verified time of sample receipt

SECTION 1.0

INTRODUCTION

1.1 Installation Restoration Program

Environmental Resources Management (ERM) has prepared a Work Plan Addendum to describe the Supplemental Remedial Investigation/ Focused Feasibility Study (SRI/FFS) tasks that are proposed to quantify the concentrations of benzene, ethylbenzene, and xylenes (BEX) in groundwater in on-site and off-site portions of the dissolved plume. The results of the Supplemental Remedial Investigation (SRI) portion of the project and associated sampling of the monitoring wells after completion of the pilot test were used to refine the remedial alternative(s) recommended in the Final Feasibility Study Report (ERM, March 2010).

Review of laboratory analytical results from ERM's March 2010 Technical Memorandum (TM), for the off-site plume delineation indicated that benzene, ethylbenzene, and xylenes were detected in off-site groundwater at concentrations above ambient groundwater quality standards and guidance values established by the New York State Department of Environmental Conservation (NYSDEC). Toluene and methyl tert butyl ether (MTBE) were not detected at concentrations above applicable standards, criteria, and guidance (SCGs) in any of the wells sampled during the plume delineation, suggesting that toluene and MTBE are not compounds of potential concern at Site 15 or the off-site property.

Based on these results, ERM concluded that the extent of BEX affected groundwater has been delineated on the Hancock ANGB property, Brooklawn Golf Course (BGC) property and the Ram Tech Consulting Corporation (RamTech) property. Available data suggests that BEX-affected groundwater also extends beyond the RamTech property towards the south and/or southeast to neighboring property owned by General Electric (GE) and results presented in the March 2010 TM indicate that affected ground water has not reached the National Grid Property or Leys Creek.

SECTION 2.0

PROJECT ORGANIZATION

ERM shall maintain and use a project management system capable of tracking scheduled tasks, and percentage of individual tasks completed. This schedule shall present the timing of events and deliverables necessary to complete this project. ERM shall streamline the schedule, conducting as many activities concurrently as is technically feasible. The schedule shall be based on a work break down structure that corresponds to the breakdown of tasks in this SOW. The initial approved schedule by the HQ ANG PM shall not be modified and shall remain as the baseline for which to compare the progress of activities. A current schedule shall be updated as the schedule changes caused by new requirements or activity slippage. The most current timeline shall be submitted in the progress report every month.

SECTION 3.0

PURPOSE AND OBJECTIVES

3.1 Installation Restoration Program

This Quality Assurance Project Plan (QAPP) was prepared for this Work Plan Addendum for the Hancock Air National Guard Site 15. It is intended to set forth guidelines for the generation of reliable data by measurement activities, such that data generated are scientifically valid, defensible, comparable and of known precision and accuracy.

This QAPP contains a detailed discussion of the quality assurance (QA) and quality control (QC) protocols to be utilized by ERM and laboratory personnel, as well as a project description, and project organization and responsibilities.

3.2 Definitions

The parameters that will be used to specify data quality objectives (DQO), and to evaluate the analytical system performance for all analytical samples are precision, accuracy, representativeness, completeness and comparability (PARCC). Definitions of these and other key terms used in this QAPP are provided below.

- Accuracy - the degree of agreement of a measurement with an accepted reference value. Accuracy is generally reported as a percent recovery, and calculated as:

$$\frac{\text{Measured Value}}{\text{Accepted Value}} \times 100$$

- Analyte - the chemical or property for which a sample is analyzed.
- Comparability - the expression of information in units and terms consistent with reporting conventions, the collection of data by equivalent means or the generation of data by the same analytical

method. Aqueous samples will be reported as μg/l and solid samples will be reported in units of mg/kg, dry weight.

- Completeness - the percentage of valid data obtained relative to that which would be expected under normal conditions. Data are judged valid if they meet the stated precision and accuracy goals.

- Duplicate - two separate samples taken from the same source by the same person at essentially the same time and under the same conditions that are placed into separate containers for independent analysis. Duplicate samples are intended to assess the effectiveness of equipment decontamination, the precision of sampling efforts, the impacts of ambient environmental conditions on sensitive analyses (e.g., volatile organics analysis (VOA)), and the potential for contaminants attributable to reagents or decontamination fluids. Identifying such potential sources of error is essential to the success of the sampling program and the validity of the environmental data. Each QC sample is described below. As a minimum, each set of ten or fewer field samples will include a trip blank (TB), a duplicate and one sample collected in a sufficient volume to allow the laboratory to perform a matrix spike.

- Field Blanks – field blanks (FB) (sometimes referred to as "equipment blanks" or "sampler blanks") are the final analyte-free water rinse from equipment decontamination in the field and are collected at least once during a sampling episode. If analytes pertinent to the project are found in the FB, the results from the blanks will be used to qualify the levels of analytes in the samples. This qualification is made during data validation. The FB is analyzed for the same analytes as the sample that has been collected with that equipment.

- Precision - a measure of the agreement among individual measurements of the sample property under prescribed similar conditions. Precision is generally reported as Relative Standard Deviation (RSD) or Relative Percent Difference (RPD). Relative standard deviation is used when three or more measurements are available and is calculated as:

$$\text{RSD} = \frac{\text{Standard Deviation}}{\text{Arithmetic Mean}} \times 100$$

Relative percent difference is used for duplicate measurements and is calculated as:

$$\text{RPD} = \frac{\text{Value 1 - Value 2}}{\text{Arithmetic Mean}} \times 100$$

- Quality Assurance (QA) - all means taken in the field and inside the laboratory to make certain that all procedures and protocols use the same calibration and standardization procedures for reporting results; also, a program which integrates the quality planning, quality assessment, and quality improvements activities within an organization.

- Quality Control (QC) - all the means taken by an analyst to ensure that the total measurement system is calibrated correctly. It is achieved by using reference standards, duplicates, replicates, and sample spikes. Also, the routine application of procedures designed to ensure that the data produced achieve known limits of precision and accuracy.

- Replicate - two aliquots taken from the same sample container and analyzed separately. Where replicates are impossible, as with volatile organics, duplicates must be taken.

- Representativeness - degree to which data represent a characteristic of a set of samples. The representativeness of the data is a function of the procedures and caution utilized in collecting and analyzing the samples. The representativeness can be documented by the relative percent difference between separately collected, but otherwise identical sample volumes.

- Trip Blanks (TB) - trip blanks are samples that originate from analyte-free media taken from the laboratory to the sampling site and returned to the laboratory with the volatile organic samples. One TB should accompany each sampling shipment containing volatile organics; it will be stored at the laboratory with the samples, and analyzed with the sample set. TBs are only analyzed for volatile organic compounds (VOCs).

3.3 Overall Data Quality Objectives

Data Quality Objectives (DQO) are quantitative and qualitative statements specifying the quality of the environmental data necessary to support the decision-making process to guide the Work Plan and any subsequent corrective actions. DQO define the total uncertainty in the data that is acceptable for each activity. This uncertainty includes both sampling error and analytical error. Ideally, the prospect of zero uncertainty is the objective; however, the very processes by which data are collected in the field and analyzed in the laboratory contribute to the uncertainty of the data. It is the overall objective to keep the total uncertainty to a minimal level such that it will not hinder the intended use of the data.

As discussed above, the parameters that will be used to specify data quality requirements and to evaluate the analytical system performance for the samples are PARCC. The overall objectives are established such that there is a high degree of confidence in the measurements.

3.4 Field Investigation Data Quality Objectives

In order to permit calculation of precision and accuracy for the sampling media, blind field duplicate samples will be collected, analyzed and evaluated.

Through the submission of field QC samples, the distinction can be made between laboratory problems, sampling technique considerations, sample matrix effects, and laboratory artifacts. To assure media sample representativeness, all sample collection will be performed in strict accordance with the procedures set forth in this QAPP.

Precision will be calculated as RPD if there are only two analytical points and percent relative standard deviation (% RSD) if there are more than two analytical points. Blind field duplicate sample analyses will provide the means to assess precision.

Representativeness will be assured through the implementation of the structured and coherent Work Plan building characterization and pre-sampling location inventory of which this QAPP is a part. This Work Plan has been designed so that the appropriate numbers of samples of each location of interest are obtained for analysis.

Ideally, 100% completeness is the goal. However, it must be recognized that unforeseen issues may result in the generation of some data that may not be acceptable for use. Therefore, a completeness target of 90%, as determined by the total number of usable data points versus the total number of data points measured, will be the realistic goal of this program.

Comparability is defined as the extent to which data from one data set can be compared to similar data sets. Comparability between data sets is often questionable due to issues such as different analytical methods used or inter-laboratory differences. In order that the data generated as part of this project remain comparable to any previously generated data or data to be generated in the future, currently published analytical methods have been identified for the analysis of the collected samples. An analytical laboratory with a demonstrated proficiency in the analysis of similar samples by the referenced methods will perform these methods. In addition, samples will be collected using documented procedures to ensure consistency of effort and reproducibility if necessary.

3.5 Laboratory Data Quality Objectives

The analytical laboratory will demonstrate analytical precision and accuracy by the analysis of various QC samples (i.e., laboratory duplicates, spike samples, matrix spike duplicates and laboratory control samples). Precision, as well as instrument stability, will also be demonstrated by comparison of calibration response factors from the initial calibration to that of the continuing calibrations. Laboratory accuracy will be evaluated by the addition of surrogate and matrix spike compounds, and will be presented as percent recovery (%R). Precision will be presented as RPD, % RSD, or percent difference (%D), whichever is appropriate for the number and type of QC samples analyzed. Laboratory blanks can also be used to demonstrate the accuracy of the analyses and possible effects from laboratory artifact contamination.

PROJECT ORGANIZATION ANDRESPONSIBILITY

While all personnel involved in an investigation and in the generation of data are implicitly a part of the overall project management and QA program, certain members of the Project Team have specifically designated responsibilities. Project Team members with specific management and quality assurance roles in the Work Plan are the ERM Project Director (PD), the ERM Project Manager (PM), the ERM Field Team Leader (FTL) and the ERM Quality Assurance Officer (QAO). In the following sections, the roles and responsibilities of key personnel are identified.

4.1 ERM Project Director

The ERM Project Director (PD), Mr. Geof Moss, will oversee the ERM PM and be responsible for all technical aspects of the project, including the overall quality of the project and project deliverables for ERM. Mr. Moss is responsible for ensuring the successful completion of each project phase and the project as a whole. Mr. Moss has extensive experience with the management and coordination of multi disciplinary environmental field investigation and remedial projects in throughout the United States.

4.2 ERM Project Manager

The ERM Project Manager (PM), Mr. David W. Myers, C.G., will report to the ERM PD. Mr. Myers will oversee the ERM QAO and the ERM FTL, field investigation staff, and any subcontractors. Mr. Myers will also be responsible for all technical aspects of the project for ERM. This includes scheduling, communicating to the PD, technical development and review of all field activities, subcontracting, and the overall quality of the project and project deliverables for ERM. Mr. Myers has extensive experience in the management and coordination of multi disciplinary field investigation and remedial projects in New York State.

4.3 ERM Quality Assurance Officer

The ERM Quality Assurance Officer (QAO), Ms. Melissa McGinness, will report to the ERM PM. Ms. McGinness will have overall responsibility for QA/QC review of all analytical data generated during the field investigation, data validation and qualification of analytical results in terms of data usability. Ms. McGinness has extensive analytical laboratory experience and experience in the validation of analytical data and the protocols and QC specifications of the analytical methods and the data validation guidance, United States Environmental Protection Agency (USEPA) National Functional Guidelines for Organic and Inorganic Data Review and USEPA Region II Data Review Standard Operating Procedures (SOPs).

4.4 ERM Field Team Leader

The ERM Field Team Leader (FTL), Mr. Robert Sents, will report to the ERM PM and the RPMs. Mr. Sents will be responsible for the day-to-day management and coordination of ERM field staff and subcontractors. Mr. Sents will be responsible for the implementation and quality of the field activities. Mr. Sents has extensive environmental field investigation/subcontractor oversight experience in New York State.

The following table summarizes the Personnel Information on this project and also provides contact information.

Name	*Title*	*Company*	*Address*	*Telephone Number*
Geof Moss	Project Director (PD)	ERM	7272 E. Indian School Rd. Scottsdale, Arizona 85251	(480) 998-2401
David W. Myers	Project Manager (PM)	ERM	5788 Widewaters Pkwy Dewitt, New York 13214	(518) 461-8936
Melissa McGinness	Quality Assurance Officer (QAO)	ERM	5788 Widewaters Pkwy Dewitt, New York 13214	(315) 445-2554
Robert Sents	Field Team Leader (FTL)	ERM	5788 Widewaters Parkway Dewitt, New York 13214	(315) 445-2554

SECTION 5.0

FIELD QUALITY ASSURANCE/QUALITY CONTROL

5.1 Equipment Maintenance

In addition to the laboratory analyses conducted during the course of this Work Plan, sampling locations will be screened with a photo-ionization detector (PID) prior to sample collection to preliminarily assess the presence of VOCs. If groundwater sampling is required at the existing wells, groundwater field tests for various parameters will be performed using a Horiba U-22 prior to sample collection. In addition, an interface probe will be used at groundwater sampling locations at existing wells to determine the presence or absence of non-aqueous phase liquid (NAPL).

A maintenance, calibration, and operation program will be implemented to ensure that routine calibration and maintenance is performed on all field instruments. ERM's equipment manager ERM's Field Team Leader, the Quality Assurance Officer (QAO) and the field team members will administer the program. ERM's equipment manager will perform the scheduled monthly and annual calibration and maintenance. Monthly and annual maintenance, calibration and equipment operation will follow the procedures outlined in the manufacturer's Operation and Field Manuals accompanying the respective instruments.

5.2 Equipment Calibration

Trained field team members will be familiar with the field calibration, operation, and maintenance of the equipment. They will perform field calibrations, checks, and instrument maintenance daily. A trained team member will perform daily field checks and instrument maintenance prior to use. A trained team member using standard calibration gas will calibrate the PID. Field maintenance, calibration and equipment operation will follow the procedures outlined in the manufacturer's Operation and

Field Manuals accompanying the respective instruments. All maintenance and calibration will be documented on an instrument-specific calibration/ maintenance form.

The Field Team Leader (FTL) will be responsible for keeping a master instrument calibration/maintenance form for each measuring device. Each form will include at least the following relevant information:

- Name of device and/or instrument calibrated;
- Device/instrument serial and/or identification (I.D.) number;
- Frequency of calibration;
- Date of calibration;
- Results of calibration;
- Name of person performing the calibration; and
- Identification of the calibration standards.

In lieu of a form, this information may be recorded in the field logbook.

5.3 Equipment Decontamination

In order to minimize the potential for cross-contamination, all sampling equipment will be properly decontaminated prior to and after each use. Sampling equipment decontamination protocol will be performed according to Section 2.8 - Decontamination of Equipment - on pages 2-24 and 2-25 of the Environmental Restoration Program Air National Guard Investigative Guidance dated July 2005.

5.3.1 General Procedures

If equipment and probes have a visible sheen or discernable odor after sampling, they will be decontaminated in an area covered by plastic near the sampling location and all solvents and wash water used in the decontamination process will be collected and drummed for off-site disposal. All disposable sampling equipment will be properly disposed of in dry containers.

Extraneous contamination and cross-contamination will be controlled by wrapping the sampling equipment with aluminum foil when not in use and changing and disposing of the sampler's gloves between samples. Decontamination of sampling equipment will be kept to a minimum in the field, and wherever possible, dedicated sampling equipment will be used. Personnel directly involved in equipment decontamination will wear appropriate protective equipment.

5.3.2 Air Sampling Equipment

If required, laboratory prepared sampling vials will be used during all indoor air sampling activities performed under the Work Plan. In the event that field decontamination of reusable sampling equipment is necessary, decontamination procedures will be as follows:

- Laboratory-grade glassware detergent and tap water scrub to remove visual contamination;
- Generous tap water rinse;
- Distilled and deionized (American Standard for Testing of Materials (ASTM) Type II) water rinse;
- 10% nitric acid rinse, followed by a distilled and deionized water rinse (metals only), or
- Methanol (pesticide grade) rinse (volatiles only);
- Total air dry; and
- Distilled and deionized water rinse.

Since dedicated new lengths of polyethylene tubing will be used for sampling, the tubing will not be decontaminated. A laboratory certified clean sampling vial and certified clean pump will be used for each indoor air sampling location.

Prior to preparing each sampling location, any reusable equipment will be decontaminated as follows:

- Potable water rinse;
- Alconox detergent and potable water scrub;
- Potable water rinse;

- Distilled/deionized water rinse; and
- Wrap in aluminum foil, shiny side facing out.

5.3.3 Groundwater Sampling Equipment

In the event that field decontamination of reusable sampling equipment is necessary, decontamination procedures will be as follows:

- Laboratory-grade glassware detergent and tap water scrub to remove visual contamination;
- Generous tap water rinse; and
- Distilled and deionized (ASTM Type II) water rinse;
- 10% nitric acid rinse, followed by a distilled and deionized water rinse (metals only), or
- Methanol (pesticide grade) rinse (volatiles only);
- Total air dry; and
- Distilled and deionized water rinse.

5.3.4 Meters and Probes

All meters and probes that are used in the field will be decontaminated between uses as follows:

- phosphate-free laboratory detergent solution;
- tap water;
- alconox rinse (at the FTL's discretion if deemed necessary); and
- deionized water (triple rinse).

5.4 Quality Assurance/ Quality Control Sampling

Specific guidance regarding the collection of field and laboratory QA/QC samples is presented separately below.

5.4.1 Field QA/QC Samples

Trip Blanks

If applicable, the trip blank will be used to determine if any cross-contamination occurs between aqueous samples during shipment if applicable. Trip blanks will be supplied by the analytical laboratory as aliquots of distilled, deionized water that will be sealed in a sample bottle prior to initiation of each day of fieldwork. Glass vials (40 ml) with Teflon®-lined lids will be used for trip blanks. The sealed trip blank bottles will be placed in a cooler with the empty sample bottles and will be shipped to the site by the laboratory personnel. If multiple coolers are necessary to store and transport aqueous VOC samples, then each cooler must contain an individual trip blank. Trip blanks will not be collected in conjunction with the air samples.

Field Blanks

If applicable, field blanks will be collected to evaluate the cleanliness of aqueous sampling equipment, sample bottles and the potential for cross-contamination of samples due to handling of equipment, sample bottles and contaminants present in the air. Field blanks will be collected at a frequency of one per decontamination event for each type of sampling equipment (e.g., a groundwater bailer for groundwater) at a minimum of one per equipment type and/or media per day. Field blanks will not be collected in conjunction with the air samples.

Field blanks will be collected prior to the occurrence of any analytical field sampling event by pouring deionized or potable water over a particular piece of sampling equipment and into a sample container. The analytical laboratory will provide field blank water and sample jars with preservatives for the collection of all field blanks. Glass jars will be used for organic blanks. The field blanks as well as the trip blanks will accompany field personnel to the sampling location. The field blanks will be analyzed for the same analytes as the environmental samples being collected that day and will be shipped with the samples taken.

Field blanks will be taken in accordance with the procedure described below:

- Decontaminate sampler using the procedures specified in the QAPP;
- Pour distilled/deionized water over the sampling equipment and collect the rinseate water in the appropriate sample bottles;

- The sample will be immediately placed in a sample cooler and maintained at a temperature of 4°C until receipt by the laboratory; and
- Fill out sample log, labels and COC forms, and record in field notebook.

Temperature Blanks

If applicable, the laboratory will use an infrared instrument to measure the temperature of liquid samples.

5.4.2 Laboratory QA/QC

Blind Field Duplicate Samples

Blind field duplicate samples for groundwater will be collected and analyzed to check laboratory reproducibility of analytical data. Blind field duplicate samples will be collected at a frequency of 5% (one out of every 20 samples) of the samples collected to evaluate the precision and reproducibility of the analytical methods. If 20 samples are not collected at each site, one blind field duplicate sample will be collected for each sampled media (soil and groundwater (if applicable)). The 5% duplicate frequency is applied to the sampling method (i.e. soil and groundwater) rather than the total sample number. All blind field duplicate samples will be submitted to the analytical laboratory as normal samples; however, the sample will have a traceable, fictitious sample identification and fictitious time of sample collection. Each blind field duplicate will be cross-referenced to document which actual sample it is in the field notes and on the master sample log.

Matrix Spike/Matrix Spike Duplicate

Additional environmental sample volume will be collected for use as MS/MSD samples at a frequency of at least 5% (one out of every 20 samples) of the total number of samples collected to evaluate the precision and reproducibility of the analytical methods. To ensure the laboratory has sufficient volume for MS/MSD analysis, triple sample volume must be submitted for aqueous organic extractable and volatile samples once per every 20 samples in a sample delivery group (SDG). MS/MSD samples will not be collected in conjunction with the air samples.

5.5 Field Records

Proper management and documentation of field activities is essential to ensure that all necessary work is conducted in accordance with the Work Plan and QAPP in an efficient and high quality manner. Field management procedures include following proper chain of custody (COC) procedures to track a sample from collection through analysis, noting when and how samples are split (if necessary), making regular and complete entries in the field logbook, and the consistent use and completion of field management forms. Field management forms and the field logbook will be used to document all field activities as this documentation will support that the samples were collected and handled properly, making the resultant data complete, comparable and defensible. Field logbook procedures and field management forms are identified in the following sections.

5.5.1 Field Logbook

The sample team or individual performing a particular sampling activity will keep a weatherproof field notebook. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence. The field notebook entries should be factual, detailed, and objective. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which will be kept as a permanent record. The field notebook will be filled out at the location of sample collection immediately after sampling. It will contain sample descriptions including: sample number, sample collection time, sample location, sample description, sampling method used, daily weather conditions, field measurements, name of sampler, and other site-specific observations. The field notebook will contain any deviations from protocol and why, visitor's names, community contacts made during sampling, geologic investigation activities, and other site-specific information which may be noteworthy.

5.5.2 Field Management Forms

In addition to maintenance of a field logbook, the use of field management forms will supplement field logbook entries for all field activities associated with this project. Field management forms provide a regular format to record the relevant information for a particular field activity. Use of these forms will ensure that the field team consistently and completely records all pertinent data relative to a particular field activity on a regular basis. All forms, sample labels, custody seals and other sample documents will be filled out completely.

A list of the forms and the associated activities for which each form could potentially be completed is presented below.

Form	*Activity*	*Appendix*
Daily Field Report	Every day of field activity.	Appendix A
Daily Instrument Calibration Log	Every day a field instrument is used.	Not Applicable
Soil Sampling Record	All soil confirmation sampling locations.	Appendix B
Groundwater Sampling Record	All groundwater sampling locations.(if applicable)	Appendix C
COC Form	All field sampling efforts.	Appendix D

5.6 Sample Preparation and Custody

5.6.1 Sample Identification

In order to provide for proper identification in the field and proper tracking in the laboratory, all samples must be labeled in a clear and consistent fashion using the procedures and protocols described below and within the following subsections.

- Sample labels will be waterproof and have a pre-assigned, unique number that is indelible.

- Field personnel must maintain a field notebook. This notebook must be water resistant with sequentially numbered pages. Field activities will be sequentially recorded in the notebook.

- The notebook, along with the COC form, must contain sufficient information to allow reconstruction of the sample collection and handling procedure at a later time.

- Each sample will have a corresponding notebook entry which includes:

    - Sample ID number;
    - Sample location;
    - Date and time;
    - Analysis for which sample was collected;
    - Additional comments as necessary; and
    - Sampler's name.

- Each sample must have a corresponding entry on a COC manifest.

- The manifest entry for sampling at any one location is to be completed before sampling is initiated at any other location by the same sampling team.

- In cases where the samples leave the immediate control of the sampling team (i.e., shipment via common carrier) the shipping container must be sealed.

Each sample collected will be designated by an alphanumeric code that will identify the Site and a specific sample designation (identifier). The Site identification number will be "ANG" (Air National Guard).

The specific sampling designation (identifier) will be identified using an alphanumeric sub-code; groundwater sample identifiers will be consecutive numbers for temporary points, or if collected from an existing monitoring well, the identifier will be the well designation. Soil confirmation sample identifiers will have an alphanumeric sub-code "SC" and a number prefix 01 through 05 in the order of sample collection. For example:

- ANG-MW-1 for designated monitoring wells.

In the case of QC samples such as blind field duplicate samples, the nomenclature will be as follows:

- ANG-GW-XX-DUP(date) for groundwater samples.
- The "XX" will be replaced with a consecutive numeric code if more than one duplicate sample will be collected during any particular day.
- Six digits will be used to represent the date (e.g., DUP080105 would represent a duplicate collected on 1 August 2008).

5.6.2 Sample Containers

- The analytical laboratory will provide all containers for groundwater sample collection and indoor air sampling vials.
- The vials and containers will be inspected and certified clean by the laboratory prior to shipping. All sample canisters will be handled carefully so that the canisters are not inadvertently compromised and will be handled carefully so they do not break or the preservatives are not spilled.

The tables presented in Appendix E lists the analyses, preservative added, number of containers, container size for samples to be collected and the requested method detection limits (MDLs). Please note the minimum reporting limits for the analytes in air samples will be 0.03 micrograms per cubic meter for 24-hour active samples and for the 30-day passive samples.

5.6.3 Sample Preservation

Once groundwater samples have been collected, they will be sealed in a waterproof container and placed in a pre-cooled container and held at a temperature of not more than 4°C.

Sample Holding Time

- All samples will be shipped the same day they are collected to the analytical laboratory. Any exceptions will be documented in the field logbook and proper preservation techniques will be followed.
- The samples must be analyzed within specified holding times. See above table.
- The analytical laboratory will be a New York State Department of Health (NYSDOH) ELAP-certified laboratory and conform to meeting specifications for documentation, data reduction and reporting. The laboratory will follow all method specifications pertaining to sample holding times contained in the NYSDEC Analytical Services Protocol (ASP) revised July 2005 and/or as prescribed by the specific analytical method.

Sample Custody

COC - The primary objective of the sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. All field-sampling personnel will adhere to proper sample custody procedures because samples collected during an investigation could be used as evidence in litigation. Therefore, possession of the samples must be traceable from the time each sample is collected until it is analyzed at the laboratory.

Custody Transfer to Field Personnel - The field personnel will maintain custody of samples collected during this investigation. All field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are shipped to the laboratory. COC records will be completed at the time of sample collection and will accompany the samples inside the cooler or shipping box for shipment to the selected laboratory.

Each individual who has the samples in their possession will sign the COC record. Preparation of the COC record is as follows:

- For each sample, the person collecting the sample will initiate the COC record in the field. Every sample will be assigned a unique identification number that is entered on the COC Record (see Section 5.6.1 above).
- The record will be completed in the field to indicate project, sampling team, etc.
- If the person collecting the sample does not transport the samples to the laboratory or deliver the sample containers for shipment, the first block for Relinquished By __________, Received By __________ will be completed in the field.
- The person transporting the samples to the laboratory or delivering them for shipment will sign the record form as Relinquished By ____________.
- If a commercial carrier ships the samples to the laboratory, the original COC record will be sealed in a watertight container and placed in the shipping container, which will be sealed prior to being given to the carrier. The carbonless copy of the COC record will be maintained in the field file.
- If the samples are directly transported to the laboratory, the COC will be kept in the possession of the person delivering the samples.
- For samples shipped by commercial carrier, the waybill will serve as an extension of the COC record between the final field custodian and the laboratory.
- Upon receipt in the laboratory, the Sample Custodian or designated representative will open the shipping containers, compare the contents with the COC record, and sign and date the record. Any discrepancies will be noted on the COC record.
- If discrepancies occur, the samples in question will be segregated from normal sample storage and the field personnel immediately notified.

- COC records will be maintained with the records for a specific project, becoming part of the data package.

Custody Transfer to Laboratory - All samples collected during the Work Plan will be submitted to a NYSDOH ELAP-certified laboratory meeting specifications for documentation, sample login, internal chain of custody procedures, sample/analysis tracking, data reduction and reporting. The laboratory will follow all specifications pertaining to laboratory sample custody procedures contained in the NYSDEC ASP (revised July 2005).

In general, the following procedures will be followed upon sample receipt. The laboratory will not accept samples collected by project personnel for analysis without a correctly prepared COC record.

The first step in the laboratory receipt of samples is completing the COC records and project sample login form. The laboratory Sample Custodian, or designee, will note that the shipment is accepted and notify the Laboratory Manager or the designated representative of the incoming samples.

Upon sample receipt, the laboratory Sample Custodian, or designee, will:

- Examine all samples and determine if samples have been compromised during shipment. If samples have been damaged during shipment, the remaining samples will be carefully examined to determine whether they were affected. Any affected samples will also be considered damaged. It will be noted on the COC record that specific samples were damaged and that the samples were removed from the sampling program. Field personnel will be notified as soon as possible that samples were damaged and that they must be resampled, or the testing program changed, and provide an explanation of the cause of damage.

- Compare samples received against those listed on the COC record.

- Verify that sample holding times have not been exceeded.

- Sign and date the COC record and attach the waybill to the COC record.

Denote the samples in the laboratory sample log-in book which contains the following information:

- Project identification number.
- Sample numbers.
- Type of samples.
- Date received in laboratory.
- Record of the verified time of sample receipt (VTSR).
- Date put into storage after analysis is completed.
- Date of disposal.

The last two items will be added to the log when the action is taken.

- Notify the Laboratory Manager of sample arrival.
- Place the completed COC records in the project file.

The VTSR is the time of sample receipt at the laboratory. The date and time the Sample Custodian or designee logs in the samples will agree with the date and time recorded by the person relinquishing the samples.

5.6.4 Sampling Packaging and Shipping

Sample bottles or canisters will either be delivered/picked up at the site daily by the analytical laboratory, or delivered/shipped via overnight courier. Once the samples have been collected, proper procedures for packaging and shipping will be followed as described below.

Packaging

Prior to shipment, samples must be packaged in accordance with current United States Department of Transportation (USDOT) regulations. All necessary government and commercial carrier shipping papers must be filled out. The procedure below should be followed regardless of transport method:

- Check that all sampling vial/container labels are complete.

- Remove previously used labels, tape and postage from the box or cooler.
- Groundwater samples will be wrapped in bubble pack and placed in dry plastic bags, which will then be tightly sealed. They will be placed in coolers and covered with ice that has been sealed in at least two watertight plastic bags.
- Affix an address and return address label to box or cooler.
- Be sure COC forms are complete.
- Separate and retain the sampler's copy of COC and keep with field notes.
- Tape paperwork (COC, manifest, return address) in zipper bag to the inside of sample package.
- Close package and apply signed and dated custody seal in such a way that the seal must be broken to open box or cooler.
- Securely close package with packing or duct tape.

Shipping

Samples should arrive at the laboratory as soon as possible following sample collection to ensure that holding times are not exceeded. All samples must be hand delivered on the same day as sampling or sent via overnight courier. When using a commercial carrier, follow the steps below.

- Securely package samples and complete paperwork.
- Weigh package for air transport.
- Complete air bill for commercial carrier (air bills can be partially completed in office prior to sampling to avoid omissions in field). If necessary, insure packages.
- Keep customer copy of air bill with field notes and COC form.

- When packages have been released to transporter, call receiving laboratory and give information regarding samplers' names and method of arrival.
- Call the laboratory on the day following shipment to be sure all samples arrived intact. If samples have been compromised, locations can be determined from COC and resampled.

5.7 Analytical Laboratory

The data collected during the course of the Work Plan will be used to determine the presence and concentration of certain analytes in the soil.

Soil confirmation samples and if applicable, groundwater samples collected during the execution of the Work Plan will be submitted to TestAmerica North Canton (TANC) located at 4101 Shuffel Street NW., North anton, Ohio 44720.

5.8 Analytical Test Parameters

Analytical test parameters are listed in Appendix E as referenced in Section 5.6.2 of this work plan.

5.9 Instrument Calibration

The frequency of laboratory instrument calibration and associated procedures for the specific analytical methods to be followed by the selected laboratory are specified in the individual USEPA analytical method procedures. The selected laboratory's calibration schedule will adhere to all analytical method specifications.

SECTION 6.0

DATA MANAGEMENT AND REPORTING PLAN

6.1 Data Use and Management Objectives

Data Use Objectives

The typical data use objectives for this Work Plan are:

- Ascertaining if there is a threat to public health or the environment.
- Locating and identifying potential sources of impacts to air, soil and groundwater.
- Delineation of soil vapor intrusion zone, identifying clean areas, and estimating the areal extent and/or volume of impacted soil and/or groundwater.

Data Management Objectives

The primary objective of proper data management is to ensure and document that all necessary work is conducted in accordance with the Work Plan and QAPP in an efficient and high quality manner thereby maximizing the confidence in the data in terms of PARCC. Data management procedures not only include field and laboratory documentation, but also include how the information is handled after the conclusion of field investigation and after laboratory analyses are completed. Data handling procedures include project file management, reporting, usability analysis (review and validation) and use of consistent formats for the final presentation of the data.

Project File Specifications

The ERM Project Manager in ERM's Syracuse, New York office location will keep all project information in a central Project File maintained. The Project File will be assigned a unique project number that will be clearly displayed on all project file folders (including electronic files). Electronic files will be maintained in a similarly organized Project File located on the

ERM Central Network system that is backed up on a weekly basis. Both hard copy and electronic Project Files will contain, at a minimum, copies or originals of the following key project information:

- All correspondence including letters, transmittals, telephone logs, memoranda, and emails;
- Meeting notes;
- Technical information such as analytical data, field survey results, field notes, field logbooks and field management forms;
- Project calculations;
- Subcontractor agreements/contracts and insurance certificates;
- Project-specific health and safety information/records;
- Access agreements;
- Project document output review/approval documentation; and
- Reports: Monthly Progress, Interim Technical and Draft/Final Technical.

6.2 Reporting

Field Data

Field data will be recorded and reported by field personnel using appropriate field data documentation materials such as the field logbook, field management forms and COC forms.

Good field management procedures include following proper COC procedures to track a sample from collection through analysis, noting when and how samples are split (if necessary), making regular and complete entries in the field logbook, and the consistent use and completion of field management forms. Proper completion of these forms and the field logbook are necessary to support the consequent actions that may result from the sample analysis. This documentation will support that the samples were collected and handled properly, making the resultant data complete, comparable and defensible.

Laboratory Data

The analytical results of all samples collected as part of this project will be reported following NYSDEC ASP revised July 2005 specifications. All laboratory analytical data will be reported as NYSDEC Category B deliverables. The Category B data deliverables include all backup QA/QC documentation necessary to facilitate a complete validation of the data.

In addition, NYSDEC "Sample Identification and Analytical Requirement Summary" and "Sample Preparation and Analysis Summary" forms will be completed and included with each data package. The sample tracking forms are specified and supplied by the 2005 NYSDEC ASP.

The laboratory will also transmit the analytical data in an electronic format to minimize the chances of transposition errors in summarizing the data. The data will be transmitted in an electronic data deliverable (EDD) in GISKey (most recent version) format and a PDF copy of each ASP deliverable.

6.3 Data Validation

All field and laboratory data will be reviewed, validated and qualified as necessary to assess data usability by direct comparison to the specified DQOs and/or procedures set forth in this QAPP. Information that can be obtained includes comparison of results obtained from samples taken at the same location, and the identification of missing data points. Examination of the data at the end of the process allows for the assessment of data quality with respect to PARCC.

Field Data Validation Protocol

Field data generated in accordance with the Work Plan will primarily consist of VOC concentrations of soil vapor samples and groundwater samples. This data will be validated by review of the project documentation to check that all forms specified in the Field Sampling Plan and this QAPP have been completely and correctly filled out and that documentation exists for the specified instrument calibrations. This documentation will be considered sufficient to provide that proper procedures have been followed during the field investigation.

Laboratory Data Validation Protocol

Data validation is the assessment of data quality with respect to method specifications and technical performance of the analytical laboratory. Analytical data packages will be examined to ensure that all specified lab components are included, all QA/QC specifications were performed or met, and the data use restrictions are well defined.

Summary documentation regarding QA/QC results will be completed by the laboratory using NYSDEC ASP forms and will be submitted with the raw analytical data packages (NYSDEC ASP Category B deliverables). The data review will evaluate data for its quality and usability. This process will qualify results so that the end user of the analytical results can make decisions with consideration of the potential accuracy and precision of the data. For example, the results are acceptable as presented, qualified as estimated and flagged with a "J", or rejected and not useable and therefore flagged with an "R".

ERM will utilize all guidance documents and/or criteria relying on the most comprehensive reference sources to perform the most complete validation possible on both water and air samples associated with this work plan.

The data validation process will provide an informed assessment of the laboratory's performance based upon contractual requirements and applicable analytical criteria. The report generated as a result of the data validation process will provide a base upon which the usefulness of the data can be evaluated by the end user of the analytical results.

During the validation process, it will be determined whether sufficient back-up data and QA/QC results are available so the reviewer may conclusively determine the quality of data support laboratory submittals for sample results. Each data package will be checked for completeness and technical adequacy of the data. Upon completion of the review, the reviewers will develop a QA/QC data validation report for each SDG.

For the organic parameter analyses, the following items or criteria will be reviewed:

- Case narrative and deliverable compliance.
- Holding times, both technical and procedural.
- Surrogate Compound recoveries, summary and data.

- Blank Spike Sample (BSS) recoveries.
- Method blank summary and data.
- Gas Chromatography (GC)/Mass Spectroscopy (MS) tuning and performance.
- Initial and continuing calibration summaries and data.
- Internal standard areas, retention times, summary and data.
- Blind Field Duplicate sample results.
- Organic analysis data sheets (Form I).
- GC/MS chromatograms, mass spectra and quantitation reports.
- Quantitation and detection limits.
- Qualitative and quantitative compound identification.

After the Summary Reports are prepared for each SDG, the validator will prepare a Data Usability Summary Report (DUSR). The DUSR will be prepared according to the guidelines in Appendix 2B of DER-10 (May 2010) and will review the following:

- Is the data package complete as defined under the requirements for the NYSDEC ASP Category B deliverables?
- Have all holding times been met?
- Do all the QC data, including blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data, fall within the protocol required limits and specifications?
- Have all of the data been generated using established and agreed upon analytical protocols?
- Does an evaluation of the raw data confirm the results provided in the data summary sheets and qualify control verification forms?
- Have the correct data qualifiers been used?

Once the data package has been reviewed and the above questions asked and answered, the DUSR proceeds to describe the samples and the analytical parameters. Data deficiencies, analytical protocol deviations and quality control problems are identified and their effect on the data is discussed. The DUSR shall also include recommendations on resampling/reanalysis. All data qualifications must be documented following the NYSDEC ASP revised July 2005, guidelines.

6.4 Data Presentation Formats

Project data will be presented in consistent formats for all letters, Monthly Progress Reports, Interim Technical Reports, and Draft/Final Technical Reports. Specific formats will be tailored to best fit the needs of the data being presented but general specifications are described below.

Data Records

The data record will generally include one or more of the following:

- Unique sample or field measurement code;
- Sampling or field measurement location and sample or measurement type;
- Sampling or field measurement raw data;
- Laboratory analysis ID number;
- Property or component measured; and
- Result of analysis (e.g., concentration).

Tabular Displays

The following data will generally be presented in tabular displays:

- Unsorted (raw) data;
- Results for each medium or for each constituent monitored;
- Data reduction for statistical analysis;
- Sorting of data by potential stratification factors (e.g., location, soil layer/depth, topography, etc.); and
- Summary data.

Graphical Displays

The following data will be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):

- Sample locations and sampling grid;
- Boundaries of sampling area;
- Areas where additional data are necessary;
- Constituent concentrations at each sample location;
- Geographical extent of impacts;
- Constituent concentration levels, averages, minima and maxima;
- Changes in concentration in relation to distance from the source, time, depth or other parameters;
- Features affecting intramedia transport; and
- Potential receptors.

SECTION 7.0

PERFORMANCE AUDITS

7.1 Field Audits

During field activities, the QAO may accompany sampling personnel into the field to verify that the sampling program is being properly implemented and to detect and define problems so that corrective action can be taken. All findings will be documented and provided to the ERM Project Manager and FTL.

7.2 Laboratory Audits

The NYSDOH ELAP certified laboratory that has satisfactorily completed performance audits and performance evaluation samples will be used for all sample analysis. The results of the most recent performance audits and performance evaluations will be made available upon request.

7.3 Corrective Actions

The NYSDOH ELAP certified laboratory utilized for this project will meet the specifications for corrective action protocols typical for performing contract laboratory services. Laboratory corrective action may include instrumentation maintenance, methods modification, and cross-contamination/carry over issues, sample tracking practices, laboratory information management (LIMs), etc.

Prior to mobilization for the field investigation, a meeting may be scheduled among representatives of ERM and the laboratory to discuss a general corrective action approach and establish procedures to ensure good and timely communications among all parties during the investigation. New procedures will be put into effect as appropriate.

SECTION 8.0

WASTE DISPOSAL PLAN

8.1 Investigative Derived Wastes

The following section describes the general protocol for handling and disposal of liquid wastes generated during the Work Plan. Waste generated during the Work Plan is expected to consist of trash (boxes, paper, etc.), decontamination wash water, and used PPE.

The following guidance documents and regulations may be relied upon to guide the management, staging and storage of any potential excavation derived waste materials.

- 40 C. F. R. Part 268 (Land Disposal Restrictions).

Accordingly, handling and disposal will be as follows:

- Liquid generated during well purging or decontamination activities that do not exhibit visible staining, sheen, or discernable odors will be discharged to an unpaved area on the Site, where it can percolate into the ground.

8.2 Other Wastes

- Non-contaminated trash and debris will be placed in a trash dumpster and disposed of by a local garbage hauler.
- Non-contaminated protective clothing will be packed in plastic bags and placed in a trash dumpster for disposal by a local garbage hauler.

APPENDIX A

DAILY FIELD REPORT FORM

ERM

DAILY FIELD REPORT

DATE: ____________ JOB NO: ________

TIME: (arrive) ________ (depart) ________

LOCATION: ______________________ ACTIVITY: ______________________

FILED BY: ______________________ SIGNATURE: ______________________

FORMS ATTACHED TO THIS REPORT:

☐ Chain of Custody
☐ Shipping Manifest
☐ Field Sampling Reports
☐ Equipment Charge
☐ Subcontractor Invoice
☐ Injury Report

---

1. Significant work accomplished today?

Draw a sketch showing the location of site activity.

2. What field personnel and equipment were used today?

DAILY FIELD REPORT PAGE 2 PROJECT NO.: ______________ DATE:

3. What unusual events happened today?

Describe: ________________________________

4. Was any property damaged? YES NO

Explain: ________________________________

5. What were the weather conditions at the site?

Time of Observation: ________________________________

Precipitation: ______________ Ground moisture: ______________

Skies: ______________ Air Temperature: ______________

Wind (direction and speed): ________________________________

6. Were there any visitors to the site? YES NO

NAME - COMPANY - PURPOSE OF VISIT

7. Were any photographs taken by ERM personnel? YES NO

Please detail location and description: ________________________________

8. Additional comments:

APPENDIX B

SOIL SAMPLING RECORD FORM

Environmental Resources Management
5788 Widewaters Parkway
Dewitt, New York 13214
Phone: (315) 445-2554
Fax: (315) 445-2543

Project #:
Project Name:
Location:
Project Manager:

Sample Location:		**Collector(s):**	
Address:			
PID Meter Used: (Model, Serial #)		**Building No:**	

SUMMA Canister Record:

INDOOR AIR (IA)		**SOIL VAPOR (SV)**		**OUTDOOR SOIL GAS (OA)**	
Canister Serial No.:		Canister Serial No.:		Canister Serial No.:	
Flow Controller Id No:		Flow Controller Id No:		Flow Controller Id No:	
Start Date/Time:		Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg) [1]		Start Pressure: (inches Hg) [1]		Start Pressure: (inches Hg) [1]	
Stop Date/Time:		Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg) [2]		Stop Pressure: (inches Hg) [2]		Stop Pressure: (inches Hg) [2]	
Sample ID:		**Sample ID:**		**Sample ID:**	

Other Sampling Information:

PID Reading (ppm)		PID Reading (ppm) Room & as purged		PID Reading (ppm)	
Story/Level		Ground Surface (pavement, concrete, grass)		Depth of Vapor Probe	
Room		Slab thickness (if applicable)		Distance from Building	
Indoor Air Temp (°F)		Potential Vapor Pathways Observed?		Intake Height Above Ground Level (ft.)	
Intake Height Above Floor Level (ft.)		Noticeable Odor?		Intake Tubing used?	
Noticeable Odor?				Distance to nearest Roadway (ft.)	
Barometric Pressure ("Hg or mb)		Percent O_2/CO_2/CH_4		Noticeable Odor?	
Duplicate Sample?		Duplicate Sample?		Duplicate Sample?	

Comments:

1.- Verify pressure did not decrease noticeably from laboratory reported value (QC limit is 0.029 psi over 24 hours). Project objective is a 3 psi decrease due to limited quality with laboratory supplied pressure gauges. Do not utilize Summa canister with greater than 3 psi pressure difference.

2 - If final pressure does not change much from initial pressure, send sample to lab regardless, however note HOLD on chain-of-custody (COC). Also note for the lab to determine the final pressure in-house and contact the ERM QA/QC coordinator.

If TICs are required they should be specifically requested on the COC (I.e. TO-15 + 10 TICs).

Verify project objectives in regards to holding time (HT) and inform laboratory on the COC if HT is 14 days and not the method suggested 30 days.

Signature: ______________________________

APPENDIX C

GROUNDWATER SAMPLING RECORD FORM

LOW FLOW DATA SHEET

Well ID: ____________ **Date:** ____________ **Project Name:** ____________ **Project Number:** ____________

Weather Conditions: ____________

Pump Used

Static water level before lowflow: ____________ (feet below top of casing)

Bottom of well: ____________ (feet below top of casing)

Time Started: ____________ Time Finished: ____________

Time	**DTW**	**Pump**	**Turb.**	**Temp.**	**pH**	**Cond.**	**DO**	**Flow**	**ORP**	**Comments**
	feet	(on/off)	NTU	deg. C	SU	us/cm	mg/L	ml/min.	mv	
			+/- 10%	+/- 3%	0.1 unit	+/- 3%	+/- 10%	100-400	+/- 10 mv	

Notes:

Sample ID:

Sample Time:

Total Vol. Purged: Gallons

Samplers Initials:

g:geoforms\LowFlow (with variance).XLS
rev. 10/99

APPENDIX D

CHAIN OF CUSTODY FORMS

North Canton
4101 Shuffel Str[illegible]W.
North Canton, OH 44720
phone 330.497.9396 fax 330.497.0772

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Client Contact	**Project Manager:**	**Site Contact:**	**Date:**	COC No:
ERM	**Tel/Fax:**	**Lab Contact:**	**Carrier:**	______ of ______ COCs
5788 Widewaters Parkway	**Analysis Turnaround Time**			Job No.
Dewitt, New York 13214	Calendar (C) or Work Days (W) __________			
(315) 445-2554	TAT if different from Below _________			
(315) 445-2543	☐ 2 weeks			SDG No.
Project Name: Ang - Hancock	☐ 1 week			
Site: Syracuse, New York	☐ 2 days			
P O # : 0116255	☐ 1 day			

Sample Identification	**Sample Date**	**Sample Time**	**Sample Type**	**Matrix**	**# of Cont.**	**Filtered Sample**																			Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____________

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For __________ Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

APPENDIX E

SAMPLE CONTAINERS AND

METHOD DETECTION LIMITS/MINIMUM REPORTING LIMITS

SAMPLE HANDLING GUIDE

Inorganic and Conventional Parameters

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Parameters	EPA Method*	Container	Recommended Quantity (mL)	Preservative	Holding Time
Acidity	305.1	P,G	100	4°C	14 days
Alkalinity	310.1, 310.2	P,G	100	4°C	14 days
Ammonia	350.1, 350.2, 350.3	P,G	500	4°C, H_2S0_4 to pH <2	28 days
Biochemical Oxygen Demand (BOD)	405.1, SM 5210	P,G	1000	4°C	48 hours
Boron	200.7, 212.3	P, PTFE, Quartz	200	$HN0_3$ to pH <2	6 months
Bromide	300.0, 320.1, 9056, 9211	P,G	200	None	28 days
Chemical Oxygen Demand (COD)	410.1, 410.2, 410.3, 410.4, Hach 8000	P,G	100	4°C H_2S0_4 to pH <2	28 days
Chloride	300.0, 325.1, 325.2, 325.3, 9056, 9212, 9250/51, 9253	P,G	200	None	28 days
Chlorine, Residual	330.1, 330.2, 330.3, 330.4, 330.5	P,G	200	None	Immediately
Chromium VI	218.4, 7195, 7196, 7197, 7198, 7199	P,G	250	4°C	24 hours
Coliform, Fecal/Total	SM 9221, 9222	P,G (sterile)	100	4°C	6 hours
Color	110.1, 110.2, 110.3	P,G	100	4°C	48 hours
Cyanide	335.2, 335.3, 9010, 9012, 9013, 9213	P,G	1000	4°C, ascorbic acid, Na0H to pH > 12	14 days
Fluoride	300.0, 340.1, 340.2, 340.3, 9056, 9214	P	500	None	28 days
Hardness	130.1, 130.2	P,G	100	$HN0_3$ or H_2S0_4 to pH < 2	6 months
Iodide	345.1	P,G	200	4°C	24 hours
Metals	6010, 200, 7000 series	P,G	500	$HN0_3$ to pH < 2	6 months
Mercury	245.1, 245.2, 7470, 7471, 7472	P,G	500	$HN0_3$ to pH < 2	28 days
Nitrogen, Kjeldahl (TKN)	351.1, 351.2, 351.3, 351.4	P,G	500	4°C, H_2S0_4 to pH < 2	28 days
Nitrate	300.0, 352.1, 9056, 9210	P,G	100	4°C	48 hours
Nitrite	300.0, 354.1, 9056	P,G	100	4°C	48 hours
Nitrate + Nitrite	353.1, 353.2, 353.3	P,G	200	4°C, H_2S0_4 to pH < 2	28 days
Oil and Grease	413.1, 1664, 9070	G	1000	4°C, H_2S0_4 or HCl to pH < 2	28 days
Phenols	420.1, 420.2, 9065, 9066, 9067	G	1000	4°C, H_2S0_4 to pH < 2	28 days
Phosphorus, Total	365.1, 365.2, 365.3, 365.4, 6010	P,G	200	4°C, H_2S0_4 to pH < 2	28 days
Phosphate, Ortho	300.0, 365.1, 365.2, 365.3	P,G	200	4°C	48 hours
pH	150.1, 9040, 9045	P,G	100	None	Immediately
Radiochemistry Alpha, Beta, Radium Tritium Radon I-131	900 & 9000 series	 P G (amber) G P, G	 2000 100 3 x 40 1000	 $HN0_3$ to pH < 2 None None Na0H to pH>8	 6 months 6 months 4 days 16 days
Silica	370.1, 200.7, SM1311D	P, PTFE, Quartz	100	4°C	28 days
Solids, Dissolved (TDS)	160.1	P,G	100	4°C	7 days
Solids, Suspended (TSS)	160.2	P,G	500	4°C	7 days
Solids, Volatile (TVS)	160.4	P,G	100	4°C	7 days
Solids, Total (TS)	160.3	P,G	100	4°C	7 days

SAMPLE HANDLING GUIDE

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Inorganic and Conventional Parameters

Parameters	EPA Method*	Container	Recommended Quantity (mL)	Preservative	Holding Time
Specific Conductance	120.1, 9050	P,G	100	4°C	28 days
Sulfate	300.0, 375.1, 375.3, 375.4, 9035/36, 9038, 9056	P,G	200	4°C	28 days
Sulfide	376.1, 376.2, 9030, 9031, 9215	P,G	500	4°C, Zn acetate, Na0H to pH > 9	7 days
Sulfite	377.1	P,G	200	None	Immediately
Surfactants (MBAS)	425.1	P,G	250	4°C	48 hours
Total Organic Carbon (TOC)	415.1, 415.2, 9060	P,G	100	4°C, H_2S0_4 or H_3P0_4 to pH < 2	28 days
Total Organic Halides (TOX)	9020	G-TLC (amber)	100	4°C, H_2S0_4 to pH < 2	28 days
Total Petroleum Hydrocarbon (TPH)	418.1, 1664, 8440	G-TLC	1000	4°C, H_2S0_4 or HCl to pH < 2	28 days
Turbidity	180.1	P,G	100	4°C	48 hours

Organic Parameters

Parameters	EPA Method*	Container	Minimum Quantity (mL)	Preservative	Holding Time
Purgeable Halocarbons	601, 8021	G-TLS	2 x 40	4°C	14 days
Purgeable Aromatics	602, 8021	G-TLS	2 x 40	4°C, HCl to pH < 2	14 days
Volatile Organics	524, 624, 8260, CLP	G-TLS	2 x 40	4°C, H_2S0_4, HCl or $NaHS0_4$ to pH < 2	14 days 10 days for CLP
Pesticides (Organochlorine or Organophosphorous) and PCBs	608, 8081, 8082, 8141	G-TLC (amber)	1000	4°C, pH 5-8	7/40 days
Chlorinated Herbicides	615, 8151	G-TLC (amber)	1000	4°C	7/40 days
Semivolatile Organics (BNA), Polynuclear Aromatics	525, 625, 8270, 8310, CLP	G-TLC (amber)	1000	4°C	7/40 days 5/35 days for CLP

TCLP Parameters

Parameters	Holding Time from Collection to TCLP Extraction (days)	Holding Time from TCLP Extraction to Preparative Extraction (days)	Holding Time from TCLP/Preparative Extraction to Analysis (days)	Total Elapsed Time (days)
Volatiles	14	Not Applicable	14	28
Semivolatiles	14	7	40	61
Mercury	28	Not Applicable	28	56
Metals	180	Not Applicable	180	360

References: 40CFR Part 136 Tables IA, IB, IC, ID & IE and Table II, and others.

*The methods listed are for typical EPA references, except for SM, which refers to Standard Methods for the Examination of Water and Wastewater (18th Edition).

For bacteriological and organic parameters, add sodium thiosulfate if residual chlorine is present. Soil samples should be collected in 4-8 oz glass containers with a Teflon®-lined cap or Encores and preserved at 4°C. No preservative required for waste samples except 4°C for volatiles. Teflon® is a registered trademark of E.I. du Pont.

Acronymn Definitions:

P	Polyethylene	G-TLS	Glass with Teflon®-lined septum
G	Glass	PTFE	Fluoropolymer Resin / Teflon®
G-TLC	Glass with Teflon®-lined cap	CLP	EPA Contract Laboratory Program

TestAmerica Method Detection Limits.

Method Description	Method Code
Volatile Organic Compounds	8260B
Purge and Trap	5030B

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Benzene	71-43-2	1	0.17	ug/L
Ethylbenzene	100-41-4	1	0.18	ug/L
Toluene	108-88-3	1	0.19	ug/L
o-Xylene	95-47-6	1	0.38	ug/L
m&p-Xylene	179601-23-1	2	0.32	ug/L
Xylenes, Total	1330-20-7	2	0.32	ug/L
4-Bromofluorobenzene (Surr)	460-00-4			ug/L
Dibromofluoromethane	1868-53-7			ug/L
1,2-Dichloroethane-d4 (Surr)	17060-07-0			ug/L
Toluene-d8 (Surr)	2037-26-5			ug/L

Method Description	Method Code
Nitrogen, Nitrate-Nitrite	353.2

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Nitrogen, Nitrate Nitrite	STL00217	0.1	0.013	mg/L

Method Description	Method Code
Anions, Ion Chromatography	300

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Sulfate	14808-79-8	0.2	0.053	mg/L

Method Description	Method Code
Alkalinity	2320B

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Alkalinity	STL00171	5	1.3	mg/L

Method Description	Method Code
Metals (ICP)	6010B
Preparation, Total Metals	3010A

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Calcium	7440-70-2	0.2	0.024	mg/L
Magnesium	7439-95-4	0.1	0.012	mg/L

Method Description	Method Code
Total Hardness (as CaCO3) by	SM2340B

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Calcium hardness as CaCO3	STL00317	0.5	0.25	mg/L
Magnesium hardness as CaC	STL00318	0.82	0.41	mg/L
Hardness as calcium carbona	STL00009	1.32	0.66	mg/L

Method Description	Method Code
Ammonia	SM4500NH3_C
Ammonia, Distillation	SM4500NH3_B

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Ammonia	7664-41-7	0.2	0.093	mg/L

Method Description	Method Code
Dissolved Gases (GC)	RSK_175

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Methane	74-82-8	0.19	0.19	ug/L

VaporTrail
Analytics

Stratospheric Performance
Phone (585) 727-2825

TO-17 Analyte List Rev. 5
and Associated Method Detection Limits (MDL)
in Parts per Billion by Volume (ppbv)

As of 15 March 2010

Analyte, MDL (ppbv)

1,1,1-Trichloroethane, 0.06
1,1,2,2-Tetrachloroethane, 0.07
1,1,2-Trichloroethane, 0.06
1,1,2-Trichlorotrifluoroethane, 0.04
1,1-Dichloroethane, 0.05
1,1-Dichloroethylene, 0.10
1,2,4-Trichlorobenzene, 0.08
1,2-Dibromo-3-chloropropane, 0.05
1,2-Dibromoethane, 0.02
1,2-Dichlorobenzene, 0.07
1,2-Dichloroethane, 0.06
1,2-Dichloropropane, 0.07
1,3-Dichlorobenzene, 0.07
1,4-Dichlorobenzene, 0.06
2-Hexanone, 0.03
Benzene, 0.18
Bromodichloromethane, 0.03
Bromoform, 0.05
Carbon tetrachloride, 0.02
Chlorobenzene, 0.03
Chloroform, 0.05
cis-1,2-Dichloroethylene, 0.07
cis-1,3-Dichloropropylene, 0.04
Cyclohexane, 0.13
Dibromochloromethane, 0.03
Ethylbenzene, 0.03
Isopropylbenzene, 0.05
m,p-Xylenes, 0.02
Methylcyclohexane, 0.08
o-Xylene, 0.03
Styrene, 0.04
Tetrachloroethylene, 0.01
Toluene, 0.12
trans-1,2-Dichloroethylene, 0.09
trans-1,3-Dichloropropene, 0.04
Trichloroethylene, 0.07
Trichlorofluoromethane, 0.06

Note: VTA does not utilize MDLs as a basis for the determination of Reporting Limits (RL).