FINAL
FIELD SAMPLING PLAN

Vapor Intrusion Investigation, Monitoring Well Abandonment, Groundwater Monitoring, and Fire Suppression Reservoir Investigation
at
Air Force Plant 59
Johnson City, New York

Prepared for:

Air Force Center for Engineering and the Environment and Aeronautical Systems Center
Brooks City Base, Texas

Prepared by:

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Contract No. FA8903-08-D-8770
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PREFACE

This *Field Sampling Plan (FSP)* was written by AECOM to describe the field activities associated with the vapor intrusion investigation, monitoring well abandonment, groundwater monitoring, and fire suppression reservoir investigation at the Air Force Plant 59 (AFP 59). The work will be conducted from July 2009 through August 2010. The work is to be completed under the Air Force Center for Engineering and the Environment (AFCEE) Contract No. FA8903-08-D-8770, Task Order No. 0058.

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14. ABSTRACT

This *FSP* describes the field activities associated with the monitoring well abandonment, groundwater monitoring, and fire suppression reservoir investigation at AFP 59. The objectives of this study are: (1) to decommission eight off-site United States Geological Survey (USGS) monitoring wells; (2) to determine if groundwater contaminated with volatile organic compounds (VOCs) is exiting the AFP 59 property; (3) to further characterize 1,4-dioxane contamination in on- and off-site monitoring wells; and (4) to characterize soil, groundwater, and soil gas contamination in the fire suppression reservoir area.

15. SUBJECT TERMS

Vapor Intrusion, Well Abandonment, Groundwater Monitoring and Fire Suppression Reservoir, Air Force Plant 59

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LIST OF ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Engineering and the Environment
AFP	Air Force Plant
ags	Above Ground Surface
ASTM	American Society for Testing and Materials
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHSO	Corporate Health and Safety Officer
CoC	Chain of Custody
DoD	Department of Defense
DQO	Data Quality Objectives
ERPIMS	Environmental Resources Program Information Management System
FS	Feasibility Study
FSP	Field Sampling Plan
HASP	Health and Safety Plan
IRP	Installation Restoration Program
L/min	Liters per Minute
LNAPL	Light Non-Aqueous Phase Liquid
LTM	Long-Term Monitoring
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NYDOH	New York State Department of Health
PM	Project Manager
QAPP	Quality Assurance Project Plan
QA	Quality Assurance
QC	Quality Control

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RTC	Restoration Team Chief
SAP	Sampling and Analysis Plan
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WBV	Well Bore Volume
WP	Work Plan

1.0 INTRODUCTION

This *Field Sampling Plan (FSP)* presents, in specific terms, the requirements and procedures for conducting field operations and investigations at Air Force Plant 59 (AFP 59). This project-specific *FSP* has been prepared to ensure (1) the data quality objectives specified for this project are met, (2) the field sampling protocols are documented and reviewed in a consistent manner, and (3) the data collected are scientifically valid and defensible. This project-specific *FSP* and the *Quality Assurance Project Plan (QAPP) for the Vapor Intrusion Investigation, Groundwater Monitoring Activities, and Well Abandonment* shall constitute, by definition, an Air Force Center for Engineering and the Environment (AFCEE) *Sampling and Analysis Plan (SAP)*.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) specifies circumstances under which a *FSP* is necessary for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions. For cleanup actions at the remedial investigation/feasibility study (RI/FS) stage, the NCP requires lead agents to develop *SAPs*, which provide a process for obtaining data of sufficient quality and quantity to satisfy data needs. Such *SAPs* must include a field sampling plan 40 CFR 300.430 (b)(8)(ii).

Guidelines followed in the preparation of this plan are set out in the *Guidance for the Data Quality Objectives Process (Final)* EPA QA/G-4 (USEPA, 1994).

This *FSP* is based on the AFCEE *Model FSP, Version 1.1*, including updates as of July 11, 1997; specifications not applicable to this project have been deleted. Additional project-specific information appears in italics.

This *FSP* is required reading for all staff participating in the work effort. The *FSP* shall be in the possession of the field teams collecting the samples. All contractors and subcontractors shall be required to comply with the procedures documented in this *FSP* in order to maintain comparability and representativeness of the collected and generated data.

Controlled distribution of the *FSP* shall be implemented by the prime contractor to ensure the current approved version is being used. A sequential numbering system shall be used to identify controlled copies of the *FSP*. Controlled copies shall be provided to applicable United States Air Force (USAF) managers, regulatory agencies, remedial project managers, project managers, and quality assurance (QA) coordinators. Whenever USAF revisions are made or addenda added to the *FSP*, a document control system shall be put into place to assure (1) all parties holding a controlled copy of the *FSP* shall receive the revisions/addenda and (2) outdated material is removed from circulation. The document control system does not preclude making and using copies of the *FSP*; however, the holders of controlled copies are responsible for distributing additional material to update any copies within their organizations. The distribution list for controlled copies shall be maintained by the prime contractor.

2.0 PROJECT BACKGROUND

A project background description, including (1) the locations of sampling sites at the base or facility, (2) a summary of the contamination history at each site, and (3) the findings from previous investigations is included in Section 1.2 of the *WP*.

2.1 THE UNITED STATES AIR FORCE INSTALLATION RESTORATION PROGRAM

The objective of the United States Air Force (USAF) Installation Restoration Program (IRP) is to assess past hazardous waste disposal and spill sites at USAF installations and to develop remedial actions consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) for sites that pose a threat to human health and welfare and/or the environment. This section presents information on the program origins, objectives, and organization.

The 1976 Resource Conservation and Recovery Act (RCRA) is one of the primary federal laws governing the disposal of hazardous wastes. Sections 6001 and 6003 of RCRA require federal agencies to comply with local and state environmental regulations and provide information to the USEPA concerning past disposal practices at federal sites. RCRA Section 3012 requires state agencies to inventory past hazardous waste disposal sites and provide information to the United States Environmental Protection Agency (USEPA) concerning those sites.

In 1980, Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Superfund). CERCLA outlines the responsibility for identifying and remediating contaminated sites in the United States and its possessions. The CERCLA legislation identifies the USEPA as the primary policy and enforcement agency regarding contaminated sites.

The 1986 Superfund Amendments and Reauthorization Act (SARA) extends the requirements of CERCLA and modifies CERCLA with respect to goals for remediation and the steps that lead to the selection of a remedial process. Under SARA, technologies that provide permanent removal or destruction of a contaminant are preferable to action that only contains or isolates the contaminant. SARA also provides for greater interaction with public and state agencies and extends the USEPA's role in evaluating health risks associated with contamination. Under SARA, early determination of Applicable or Relevant and Appropriate Requirements (ARARs) is required, and the consideration of potential remediation alternatives is recommended at the initiation of a remedial investigation/feasibility study (RI/FS). SARA is the primary legislation governing remedial action at past hazardous waste disposal sites.

Executive Order 12580, adopted in 1987, gave various federal agencies, including the Department of Defense (DoD), the responsibility to act as lead agencies for conducting investigations and implementing remediation efforts when they are the sole or co-contributor to contamination on or off their properties.

To ensure compliance with CERCLA, its regulations, and Executive Order 12580, the DoD developed the IRP, under the Defense Environmental Restoration Program, to identify potentially contaminated sites, investigate these sites, and evaluate and select remedial actions for potentially contaminated facilities. The DoD issued the Defense Environmental Quality Program Policy

Memorandum (DEQPPM) 80-6 regarding the IRP program in June 1980, and implemented the policies outlined in this memorandum in December 1980. The NCP was issued by USEPA in 1980 to provide guidance on a process by which (1) contaminant release could be reported, (2) contamination could be identified and quantified, and (3) remedial actions could be selected. The NCP describes the responsibility of federal and state governments and those responsible for contaminant releases.

The DoD formally revised and expanded the existing IRP directives and amplified all previous directives and memoranda concerning the IRP through DEQPPM 81-5, dated December 11, 1981. The memorandum was implemented by a USAF message dated January 21, 1982.

The IRP is the DoD's primary mechanism for response actions on USAF installations affected by the provisions of SARA. In November 1986, in response to SARA and other USEPA interim guidance, the USAF modified the IRP to provide for an RI/FS program. The IRP was modified so that an RI/FS could be conducted as parallel activities rather than serial activities. The program now includes ARAR determinations, identification and screening of technologies, and development of alternatives. The IRP may include multiple field activities and pilot studies prior to a detailed final analysis of alternatives. Over the years, requirements of the IRP have been developed and modified to ensure that DoD compliance with federal laws, such as RCRA, NCP, CERCLA, and SARA, can be met.

2.2 PURPOSE AND SCOPE

The purpose and scope is discussed in Section 2.2 of the QAPP.

3.0 PROJECT SCOPE AND OBJECTIVES

3.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are quantitative and qualitative goals that specify the quantity and quality of the data required to support decisions during remedial response activities. Guidelines followed in the preparation of DQOs for the Vapor Intrusion Investigation at AFP 59 are set out in the *Guidance for the Data Quality Objectives Process*, EPA QA/G-4 (USEPA, 1994) and the NYSDEC Division of Environmental Remediation *Draft Technical Guidance for Site Investigation and Remediation* (NYSDEC, 2002).

Refer to the task specific work plan for the DQOs of each task.

3.2 SAMPLE ANALYSIS SUMMARY

For a list of laboratory analysis and number of samples to be analyzed, refer to the task specific work plan.

3.3 FIELD ACTIVITIES

For a description of field activities for each task, refer to the task specific work plan.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

AECOM will manage the field services, including the sample collection, data analysis, site characterization, and reporting. The project organization is shown in Figure 4-1. The following is a list of key AECOM personnel; brief descriptions of their roles are provided below.

1. Program Manager – Ken Vinson – 703-549-8728
2. Project Manager – David Parse – 703-549-8728
3. Corporate Health and Safety Officer – Herold Hannah – 412-904-3606
4. Project/Site Health and Safety Officer – Walt Gee – 703-549-8728
5. Project Quality Assurance Manager – Devon Chicoine – 703-549-8728
6. Contracts Administrator – Amy Harrington – 703-549-8728
7. Cost Administrator – Jan Moran – 703-549-8728

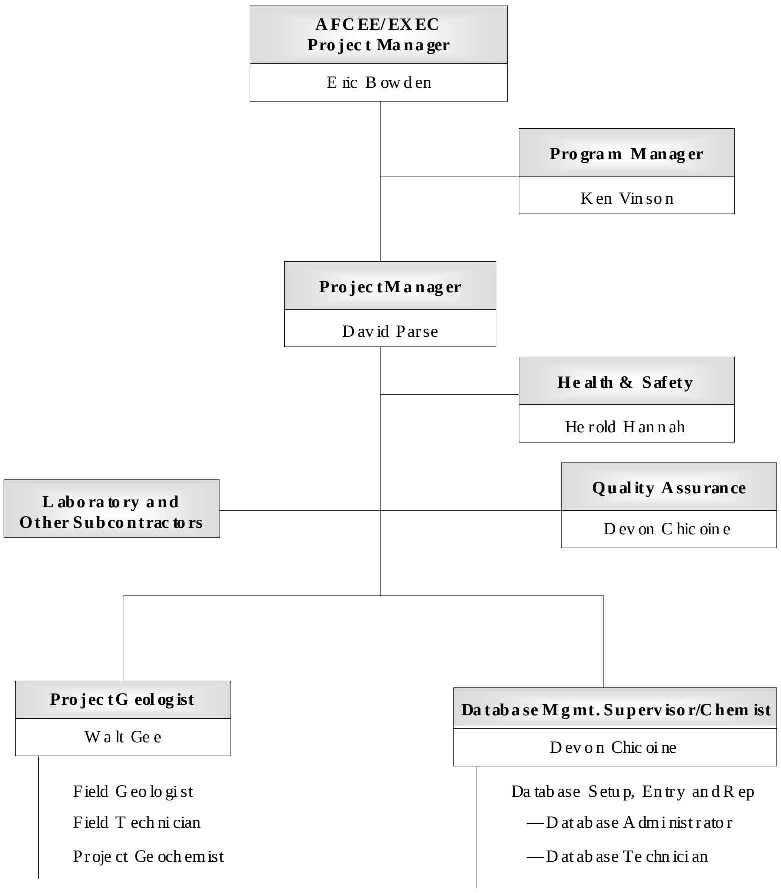
Program Manager. The Program Manager, Ken Vinson, is responsible for overall direction, coordination, technical consistency, and review of the entire contract. His responsibilities include:

1. Final approval and review of *Work Plans (WPs)*, all project deliverables, schedules, contract changes, and labor allocations for each task.
2. Approval of budgets and schedules, as well as changes in budgets or schedules.
3. Ensuring availability of key personnel assigned to the project for the duration of the contract.
4. Overseeing coordination among management, field teams, and support personnel to ensure consistency of performance.
5. Communicating, as necessary, with the AFCEE Restoration Team Chief (RTC) to evaluate the progress of the program and to facilitate the early resolution of any potential problem.
6. Frequent communication with the Project Manager (PM) to ensure that project objectives are being completed in a timely manner.

Project Manager. The Project Manager, David Parse, is responsible for the effective day-to-day management of all operations. His responsibilities include:

1. Review and approval of project deliverables including the project-specific *WP* and technical reports.
2. Review and approval of schedules, labor allocations, and sampling methods and QA plans, including chemical analysis parameters.
3. Management of all funds for labor and materials procurement.
4. Oversight of project subcontractors and coordination of all requisitions.

Figure 4-1
Project Organization Chart



5. Establishing and enforcing work element milestones to ensure timely completion of project objectives.
6. Communicating developments in the project to the Program Manager.
7. Frequent communication with the AFCEE RTC with regard to day-to-day progress of the project.
8. Providing technical guidance to project staff.
9. Assisting in resolving nonconformance issues.

Corporate Health and Safety Officer (CHSO). The CHSO, Herold Hannah, is responsible for implementing the Corporate Health and Safety Program, reviewing and approving all project-specific *Health and Safety Plans (HASPs)*, ensuring that all personnel have successfully completed health and safety training as necessary, conducting on-site health and safety inspections, providing health and safety advice and assistance to project teams, and advising the Program Manager. THE CHSO HAS THE AUTHORITY TO IMMEDIATELY STOP ALL WORK AT THE SITE FOR HEALTH AND SAFETY REASONS.

Project/Site Health and Safety Officer. The Project/Site Health and Safety Officer, Walt Gee, is responsible for implementing the Corporate Health and Safety Program, reviewing and monitoring compliance with the project-specific *HASP*, implementing corrective measures for site-specific health and safety deficiencies, ensuring required training and medical monitoring of project personnel, conducting kick-off and daily safety meetings, and maintaining health and safety records (daily logs, meeting sign-in sheets, and accident reports). THE PROJECT/SITE HEALTH AND SAFETY OFFICER HAS THE AUTHORITY TO IMMEDIATELY STOP ALL WORK AT THE SITE FOR HEALTH AND SAFETY REASONS. Specific responsibilities include:

1. Ensuring that all personnel allowed access to the site (including regulatory agency personnel) are aware of all potential hazards and current activities at the site.
2. Ensuring that all personnel are aware of and follow the provisions of this plan, and are instructed in the safety practices established in this plan, including emergency procedures.
3. Capping and locking wells to prevent unauthorized access.
4. Ensuring that all heavy machinery and equipment are locked or chained each evening upon completion of daily activities.
5. Ensuring that all potentially contaminated materials, such as purge water, are contained prior to leaving the site each day.

Project Quality Assurance Manager. Devon Chicoine is designated as the Project QA Manager. She remains independent of the cost, scheduling, and other performance constraints that are the responsibility of the Program Manager and/or the PM. The Project QA Manager's primary functions and responsibilities are to prepare, maintain, and verify compliance with the project-specific *SAP*; ensure that established laboratory and field procedures, as identified in the *SAP*, are being followed; ensure that QC documentation is provided; and ensure that all QA problems are handled in an expeditious manner. She is responsible for project activity audits to verify conformance with QA objectives and for informing the Program Manager and the PM of QA findings. The Project QA Manager will also be responsible for ensuring that all subcontractor activities are performed in accordance with QA requirements through review of subcontractor documents, laboratory data, and periodic audits. Final data review is also the responsibility of the Project QA Manager. She has the authority and responsibility to identify problems, initiate or provide solutions, verify implementation of solutions, and order the stoppage of work, if necessary.

Contracts Administrator. The Contracts Administrator will be responsible for proper procurement and execution of subcontractor agreements.

The lead regulatory agency for the Vapor Intrusion Investigation, Monitoring Well Abandonment, Groundwater Monitoring, and Fire Suppression Reservoir Investigation is the New York State Department of Environmental Conservation.

4.1 SUBCONTRACTORS

Various subcontractors will be needed to complete the Vapor Intrusion Investigation, Monitoring Well Abandonment, Groundwater Monitoring, and Fire Suppression Reservoir Investigation. For a complete listing of subcontractors that will be used on the project, refer to the task specific work plan.

5.0 FIELD OPERATIONS

This section describes field operating procedures to be followed while performing the Vapor Intrusion Investigation, Monitoring Well Abandonment, Groundwater Monitoring, and Fire Suppression Reservoir Investigation at Former AFP 59.

5.1 SITE RECONNAISSANCE, PREPARATION, AND RESTORATION PROCEDURES

As part of the initial site reconnaissance, the sample locations will be identified. Access routes to sampling locations shall be determined prior to any field activity.

Solid wastes shall be accumulated in 55-gallon drums and subsequently transported to a waste storage area designated by the Air Force. Smaller decontamination areas for personnel and portable equipment shall be provided as necessary. These locations shall include basins or tubs to capture decontamination fluids, which shall be transferred to a large accumulation tank as necessary.

The staging area for the field activities will be located in an area specified by the facility. A water supply will be provided by the facility.

Each work site shall be returned to its original condition when possible. Efforts shall be made to minimize impacts to work sites and sampling locations, particularly those in or near sensitive environments such as wetlands. Following the completion of work at a site, the trash and other waste shall be removed.

5.2 MONITORING WELL ABANDONMENT

The USGS monitoring wells (GS_9501S, GS_9501D, GS_9502S, GS_9502D, GS_9503, GS_9504, GS_9505, and GS_9506) have been recommended for abandonment. During field activities in June 2008, an attempt to locate and sample the monitoring wells was made. Four of the monitoring wells (GS_9502S, GS_9502D, GS_9505, and GS_9506) were located and sampled. The remaining four monitoring wells were unable to be sampled. Monitoring wells GS_9501S and GS_9501D were unable to be located. Monitoring well GS_9503 was located but was installed in a wetland. The well completion was compromised and was not sampled due to surface infiltration. Monitoring well GS_9504 was located but the well completion had been compromised and the pipe was obstructed.

The USGS will be abandoned in accordance with NYDEC guidance and regulations. The four monitoring wells that were located and sampled will be abandoned by breaking the end cap in place and tremie grouting the pipe using a bentonite-grout mixture. Due to accessibility concerns, monitoring well GS-9503 will be abandoned by filling the pipe with a bentonite-grout mixture. The remaining monitoring wells will be overdrilled to remove the monitoring well materials. The borehole will be filled via tremie pipe using a sodium-bentonite mixture. The surface completions will be removed and the site will be restored to like conditions.

5.3 DIRECT PUSH DRILLING, LITHOLOGIC SAMPLING, LOGGING, AND ABANDONMENT

5.3.1 Direct Push Drilling Activities

Drilling for this investigation will be conducted using a direct push drill rig to collect soil samples and install permanent soil-gas sample locations and temporary monitoring wells. The direct push drilling method involves hydraulically driving a 2-inch-diameter, 4-foot-long stainless steel sampler (similar to a split-spoon sampler) vertically into the ground. Each sampler will contain a new, non-reactive (acetate) liner. The stainless steel sampler will be advanced to the desired sampling depth. After it has been driven through the desired soil sampling interval, the sampler will be removed from the hole and the soil core will be removed from the sampler. One borehole will be advanced for the soil and groundwater sampling and to obtain lithologic information. One borehole will be advanced for each soil gas location (i.e. one for the 4-foot interval and one for the 8-foot interval) to prevent cross-contamination between locations.

Direct-push groundwater sampling involves advancing a sampling probe to the point below the water table from which the sample is desired. The probe can be advanced by direct hydraulic pressure or by using a slide or rotary hammer. When the probe is at the proper depth, sampling ports on the probe are opened, and the sample can be collected using a bailer, by vacuum pressure or using the natural pressure of the formation.

Soil-gas permanent sample locations inside the building will be installed with the direct push rig after soil and groundwater sampling has concluded. The direct push rods will be advanced to the desired depth (4 or 8 feet bgs). A 6-inch, decontaminated stainless steel vapor point will be connected to Teflon®-lined polyethylene tubing and lowered through the drill rods. A filter pack (i.e., environmental glass beads) will be emplaced around the stainless steel vapor point from the bottom of the borehole to a minimum of 1-foot above the vapor point. A 3-foot bentonite seal will be emplaced in the borehole above the filter pack for the 4 and 8 foot bgs sample locations. A Swagelok® female fitting with a hex plug fitting will be attached to the end of the tubing. The remaining annular space will be filled with hydraulic cement or concrete to the floor surface.

Temporary soil-gas locations will be installed around the fire suppression reservoir. The soil-gas samples will be collected using new, unused Teflon®-lined polyethylene tubing through the drilling rods. The soil-gas locations will be abandoned with sodium bentonite after sampling is complete.

The location of the borings shall be coordinated with the facility POC before drilling commences.

The direct push rig shall be cleaned and decontaminated in accordance with the procedure in Section 5.4. The drill rig shall not leak any fluids that may enter the borehole or contaminate equipment placed in the hole. The use of rags or absorbent materials to absorb leaking fluids is unacceptable. The fluids must be containerized using buckets and disposed of properly. Soils coming into contact with the fluids shall removed and disposed of.

A log of drilling activities shall be kept in a bound field notebook. Information in the log book shall include location, time on site, personnel and equipment present, down time, materials used, samples collected, measurements taken, and any other observations or information that would be necessary to reconstruct field activities at a later date.

The contractor shall dispose of the trash, waste grout, cuttings, and drilling fluids as coordinated with BAE Systems.

5.3.2 Sampling and Logging

The lithology in the boreholes will be logged. The Boring Log form will be used for recording the lithologic logging information. Information on the boring log sheet includes the borehole location; drilling information; sampling information such as sample intervals, recovery; PID measurements; visual observations of contamination; and sample description information.

Unconsolidated samples for lithologic description will be obtained continuously. Lithologic descriptions of unconsolidated materials encountered in the boreholes will generally be described in accordance with American Society for Testing Materials (ASTM) D-2488-90 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM, 1990). Descriptive information to be recorded in the field will include: (1) identification of the predominant particle size and range of particle sizes, (2) percent of gravel, sand, fines, or all three, (3) description of grading and sorting of coarse particles, (4) particle angularity and shape, and (5) maximum particle size or dimension.

Plasticity of fines description include: (1) color using Munsell Color System, (2) moisture (dry, moist, or wet), (3) consistency of fine-grained soils, and (4) cementation (weak, moderate, or strong).

The appropriate Unified Soil Classification System group symbol will be used. Additional information to be recorded includes the depth to the water table, caving or sloughing of the borehole, changes in drilling rate, depths of laboratory samples, presence of organic materials, and other noteworthy observations or conditions, such as the locations of geologic boundaries.

5.3.3 Air Monitoring During Drilling

Ambient air will be monitored during the drilling and sampling activities. A PID will be used to monitor concentrations of total organic compounds in the workers' breathing space and within the borehole immediately below the ground surface. Air monitoring concentrations will be recorded in the remarks column on the borehole logs. If ambient air concentrations exceed those specified in the site Health and Safety Plan (HASP), drilling will be stopped and action taken according to the site HASP.

5.3.4 Indoor Air Contaminant Minimization

During direct push drilling activities inside the AFP 59 building, measures to minimize dust and airborne contaminants from posing additional health concerns will be addressed. The exhaust of the direct push rig will vented to the exterior of the building to prevent exhaust fumes from becoming a concern. The exhaust will be vented using flexible ducts to a discharge location specified by BAE Systems.

In order to minimize airborne contaminants from posing additional health concerns, the direct push sampling sleeves will be capped and opened outside. Continuous monitoring of the breathing zone will be conducted in accordance with NYSDOH Generic Community Air Monitoring Plan (DER-10, Appendix 1A). Upon collection of the direct push MacroCore sleeves, each end of the sleeve will be capped and the sleeve will be transported to a location outside of the building for logging and sampling activities. A PID will be used to monitor the breathing zone. Alarm limits will be set at 5 ppm and 25 ppm. If 5 ppm above background is detected, at 15-minute continuous reading will be collected. If 25 ppm is detected, work will cease and identification of the source will be located. At a minimum, breathing zone readings will be noted prior to drilling, just after drilling, and just after permanent point completion. The results will be recorded in the log book.

If drilling activities occur in known areas of PCB contamination, a fine mist will be sprayed during drilling to minimize PCB-containing dust.

5.3.5 Abandonment

Boreholes created during direct push sampling activities will be abandoned by removing the drill rods from the hole and backfilling the hole with 100-percent sodium bentonite chips. At locations where asphalt and/or concrete surfaces will be drilled through, the ground surface will be patched with like materials. The bentonite shall be emplaced from the bottom to the top of the hole and subsequently hydrated to ensure an adequate seal.

5.4 SURVEYING

The direct push and off-site monitoring well locations located outside of the manufacturing building will be surveyed and recorded by a certified land surveyor as the distance in feet from a reference location that is tied to the state plane coordinate system. The surveys shall be third order. An X/Y-coordinate system will be used to identify locations. The X-coordinate shall be the east-west axis and the Y-coordinate shall be the north-south axis. The survey locations will be recorded with their X and Y coordinates in state plane coordinate values, the ground elevation, and the measuring point elevation. The horizontal location will be measured to the nearest 1 foot and referenced to the state planar coordinate system (NAD 83). Vertical elevations of the ground surface will be measured to the nearest 0.01-foot, referenced to mean sea level (NAVD 88). Surveying will be performed by a New York State licensed land surveyor who has previously surveyed at AFP 59.

Locations inside the AFP 59 building will be measured of known points (i.e. walls, columns, etc.). The sample locations will be drawn on a current building map. The sample locations will be measured in feet from the referenced locations.

Survey coordinate data will be used to create maps which show the precise locations of the direct push and vapor sample locations so contaminant distribution is properly illustrated and valid conclusions can be drawn from the soil-gas data.

5.5 EQUIPMENT DECONTAMINATION

The equipment that may directly or indirectly contact samples shall be decontaminated in a designated decontamination area. The following procedure shall be used to decontaminate large pieces of equipment. Scrub the equipment with a solution of potable water and Alconox, or equivalent laboratory-grade detergent. Then rinse the equipment with copious quantities of potable water. Air dry the equipment on a clean surface or rack, such as Teflon®, stainless steel, or oil-free aluminum elevated at least 2 feet above ground. If the sampling device shall not be used immediately after being decontaminated, it shall be wrapped in oil-free aluminum foil, or placed in a closed stainless steel, glass, or Teflon® container.

New polyethylene or Teflon®-lined polyethylene sampling tubing will be used for soil-vapor and groundwater sampling at each sampling location; therefore, decontamination of the tubing is not required.

5.6 WASTE HANDLING

5.6.1 General Waste Handling Procedures

Waste handling shall be dealt with on a site-by-site basis. Waste may be classified as noninvestigative waste or investigative waste

Noninvestigative waste, such as litter and household garbage, shall be collected on an as-needed basis to maintain each site in a clean and orderly manner. This waste shall be containerized and transported to the designated sanitary landfill or collection bin. Acceptable containers shall be sealed boxes or plastic garbage bags.

Purge water, soil cuttings, and monitoring well abandonment cuttings will be generated during the investigation. The liquid, soil, and cuttings generated during the investigation will be contained in separate 55-gallon drums. Waste disposal will be performed by a subcontractor in accordance with all applicable State and Federal regulations. Any excess water samples collected during the field activities will be disposed of by the laboratory subcontractors.

5.7 CORRECTIVE ACTION

The corrective action and nonconformance program will be conducted to discern, identify, and correct errors and defects at any point in the project. Corrective action may occur during field and laboratory activities, data validation, and data assessment. If action is required to correct problems associated with variances or non-conformances, the proposed corrective action will be approved by the PM.

A nonconformance is defined as a malfunction, failure, deficiency, or deviation that renders the quality of an item unacceptable or indeterminate. The nonconformance will pertain to all field equipment, measurements, and activities associated with the collection of data needed to fulfill the project requirements.

Corrective action in the field may be required when the sampling procedures need modifications because of unexpected circumstances. Corrective action for field measurements may include repeating the measurement to check the error, checking for proper adjustments for ambient conditions, checking the batteries, checking calibration, replacing instruments, and, if necessary, stopping work.

Technical staff and project personnel will be responsible for reporting all technical QA non-conformances or suspected deficiencies of any activity or issue. Corrective actions will be implemented and documented in the field logbook. If the non-conformance does not significantly affect the technical quality of the work, the work may continue pending resolution of the non-conformance. If corrective action is insufficient, work may be stopped.

The non-conformances and corrective action proposed and implemented will be documented in a *QA Report* to management.

6.0 ENVIRONMENTAL SAMPLING

6.1 SAMPLING PROCEDURES

The following sections provide descriptions of various sampling procedures. The construction material of the sampling devices (e.g., polyethylene) discussed below shall be appropriate for the contaminant of concern and shall not interfere with the chemical analyses being performed.

The purging and sampling equipment shall be decontaminated according to the specifications in Section 5.4 prior to any sampling activities and shall be protected from contamination until ready for use.

6.1.1 Sample Area Product Inventory

Products in each localized sample area will be inventoried to provide an accurate assessment of the potential contribution of volatile chemicals stored and/or used in the vicinity of each sample location. In addition, the type of structure, floor layout, air flows (using a smoke test kit), and physical conditions of the sample area being studied will be noted to identify and minimize conditions that may interfere with the samples. The Indoor Air Quality Questionnaire and Building Inventory Form will be completed for locations inside of the manufacturing building.

Air flow testing will be conducted during working hours and non-working areas using a smoke test kit. The pressure gradient (positive pressure or negative pressure) will be noted in the logbook. The air flow testing will be used for comparison of pressure gradients relative to the HVAC system and to determine the potential for vapor intrusion.

6.1.2 Sub-Slab Vapor Sampling

Sub-slab vapor samples will be collected from directly beneath the building slab in the AFP 59 building. Slab samples will be co-located with the indoor air samples and will be collected simultaneously. The samples will be co-located with a corresponding indoor air sample. The sub-slab vapor samples will be collected from permanent sample locations installed in July 2009. The sub-slab samples will be collected concurrently with the indoor air samples over the same 24-hour period.

The sub-slab vapor sampling protocol will be in accordance with the New York State Department of Health (NYSDOH) *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, 2006) and is as follows:

- A dedicated, stainless steel male fitting with Teflon®-lined polyethylene tubing will be attached to the permanent vapor point using Teflon® tape to seal the fittings.
- A vacuum pump or disposable syringe will be used to purge between one and three volumes of the tubing prior to sample collection. Purge rates will be <200 mL/min. The purged air will be containerized, screened with a PID, and released outside of the building. Approximately 60 to 100 ml will be purged from each location.

- After purging is complete, samples will be collected in a Summa® canister. Samples will be collected at a flow rate less than 200 mL/min.
- Duplicate sample(s) will be collected from sub-slab sampling points. The duplicate sample(s) will be taken from the same sample point using a new Summa® canister.
- Conditions of the sampling areas including floor stains and stored chemicals will be recorded at the time of sampling. Weather conditions will also be recorded.

The following information will be recorded for each sub-slab vapor sample collected:

- Sample identification,
- Date and time of sample collection,
- Sampling depth,
- Identity of samplers,
- Sampling methods and devices,
- Soil vapor purge volume,
- Volume of soil vapor extracted,
- Vacuum of Summa® canisters before and after samples are collected, and
- Chain of custody (CoC) protocols and records used to track samples from sampling point to analysis.

6.1.3 Indoor Air Sampling

Indoor air samples will be collected from inside the main manufacturing building at the AFP 59 and in the basement areas under the building. The sample locations will be located near the permanent sub-slab sample locations installed in July 2009. The manufacturing building is staffed around the clock, so vapor samples will be collected over a 24-hour period.

The indoor air sampling protocol will be in accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, 2006) and is as follows:

- Summa® canisters will be placed at the various sample locations throughout the building at a height that reflects the average breathing zone (typically 4 to 6 feet above ground surface [ags]) in a manufacturing building setting.
- Indoor air samples will be collected over a 24-hour period to accurately reflect the exposure scenario being evaluated.
- Site conditions and the activities occurring in each sampling location will be noted.
- The samples will be shipped to an Environmental Laboratory Accreditation Program (ELAP) and AFCEE-approved laboratory for VOC analysis using USEPA Method TO-15.

- A PID reading will be taken from each indoor air sample location. PID readings will be documented in the sample collection log book.

The following information will be recorded for each indoor air sample collected:

- Sample identification,
- Date and time of sample collection,
- Sampling height ags (ambient air samples),
- Identity of samplers,
- Sampling methods and devices,
- Volume of air samples,
- Vacuum of Summa® canisters before and after samples are collected, and
- CoC protocols and records used to track samples from sampling point to analysis.

6.1.4 Soil-gas Vapor Sampling

Soil-gas vapor samples will be collected from inside the main manufacturing building at the AFP 59 and around the fire suppression reservoir. The indoor sample locations will be located near the permanent sub-slab sample locations installed in July 2009. The manufacturing building is staffed around the clock, so indoor soil-gas vapor samples will be collected over a 24-hour period. The soil-gas vapor samples located around the fire suppression reservoir will be collected as a grab sample (sample rate of approximately 200 ml/min) and a tracer gas will be utilized to prevent ambient air from entering the sample train.

The soil-gas vapor sampling protocol will be in accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, 2006) and is as follows:

- Indoor soil-gas vapor samples will be collect from permanent sample locations. Soil-gas vapor samples from around the fire suppression reservoir will be collected through drill rods using direct push technology.
- A vacuum pump or disposable syringe will be used to purge between one and three volumes of the tubing prior to sample collection. Purge rates will be <200 mL/min. The purged air will be containerized, screened with a PID, and released outside of the building. Approximately 100 to 300 ml will be purged from each 4-foot sample location and 300 to 600 ml will be purged from each 8-foot sample location.
- Indoor soil-gas vapor samples will be collected over a 24-hour period to accurately reflect the exposure scenario being evaluated.
- Duplicate sample(s) will be collected from soil-gas vapor sampling points. The duplicate sample(s) will be taken from the same sample point using a new Summa® canister using a tee connector to collect the samples concurrently.
- Soil-gas vapor samples around the fire suppression reservoir will be collected as a grab sample with a flow rate not to exceed 200 ml/min.

- Site conditions and the activities occurring in each sampling location will be noted.
- The samples will be shipped to an Environmental Laboratory Accreditation Program (ELAP) and AFCEE-approved laboratory for VOC analysis using USEPA Method TO-15.
- A vacuum pump or disposable syringe will be used to purge between one and three volumes of the tubing prior to sample collection. Purge rates will be <200 mL/min. The purged air will be containerized, screened with a PID, and released outside of the building.
- A PID reading will be taken from each soil-gas vapor sample location. PID readings will be documented in the sample collection log book.

The following information will be recorded for each soil-gas vapor sample collected:

- Sample identification,
- Date and time of sample collection,
- Sampling depth
- Identity of samplers,
- Sampling methods and devices,
- Volume of air samples,
- Vacuum of Summa® canisters before and after samples are collected, and
- CoC protocols and records used to track samples from sampling point to analysis.

6.1.5 Outdoor Air Sampling

Outdoor ambient air samples will be collected from an upwind location of the manufacturing building. The samples will be collected simultaneously with the indoor air samples to evaluate the potential influence, if any, of outdoor air on the indoor air sampled. The outdoor air samples will be collected from the breathing zone, 4 feet ags, and away from any obvious sources of volatile chemicals. The outdoor air sample will be collected in the same manner as the indoor air samples, over a 24 hour period, using a Summa® canister. A sketch of the sample area will be drawn noting all pertinent observations (buildings, streets, paved areas, odors, industrial facilities). A PID will be used and the readings noted before, during, and after sample collection.

6.1.6 Air Duct and Utility Sampling

In order to determine the impact that sub-slab utilities have on vapor intrusion to the AFP 59 building, vapor and sludge samples will be collected. Floor panels will be located and opened to allow access to the utilities. If present, sludge samples will be collected in laboratory provided glass jars and submitted for VOC analysis by USEPA Method SW8260B, semi-volatile organic compounds by USEPA Method SW8270C, polychlorinated biphenyls by USEPA Method SW8082, total metals by USEPA Method SW6010B, and mercury by USEPA Method SW7471A.

The following information will be recorded for each sludge sample collected:

- Sample identification,
- Date and time of sample collection,
- Sampling depth,
- Identity of samplers,
- Sampling methods and devices,
- Conditions of the utility pipe and visual observations inside the pipe, and
- CoC protocols and records used to track samples from sampling point to analysis.

Vapor samples will be collected using Summa® canisters placed inside the utility pipe. Vapor samples will run in order to collect a grab sample at < 200ml/min. Once the Summa® canister is placed inside the utility pipe, the floor panel will be closed to seal the utility pipe. Utility vapor samples will be sampled using laboratory provided Summa® canisters and analyzed for VOCs by USEPA Method TO-15.

The following information will be recorded for each utility vapor sample collected:

- Sample identification,
- Date and time of sample collection
- Sampling depth bgs,
- Identity of samplers,
- Sampling methods and devices,
- Volume of air samples,
- Vacuum of Summa® canisters before and after samples are collected, and
- CoC protocols and records used to track samples from sampling point to analysis.

Once sampling has been completed, the floor panels will be sealed to prevent infiltration of vapors from the utilities into the building.

6.1.7 Air Intake Sampling

In order to determine the impact of outside air inside AFP 59 building, air intake samples will be collected prior to entering the HVAC equipment. Up to 10 air intake samples will be collected and analyzed for VOCs using USEPA Method TO-15. The air intake samples will be located throughout the building to assess the contribution of outside air as background concentrations.

Air intake samples will be collected using Summa® canisters placed outside the HVAC air intake. Air intake samples will run for a 24-hour period.

The following information will be recorded for each air intake sample collected:

- Sample identification,

- Date and time of sample collection
- Sampling location,
- Identity of samplers,
- Sampling methods and devices,
- Vacuum of Summa® canisters before and after samples are collected, and
- CoC protocols and records used to track samples from sampling point to analysis.

6.1.8 Direct Push Groundwater Sampling

Once the sample port has been advanced to the water table, the drill rods will be retracted to expose the sampling screen to the groundwater. New, unused polyethylene tubing will be lowered to the groundwater and a sample pump will extract the groundwater through the rods. A minimum of one tubing volume will be purged prior to sample collection.

Before collecting groundwater samples, the sampler will put on clean, phthalate-free protective gloves. The preservative hydrochloric acid will be added to the VOC sample bottle before introducing the sample water. The sample will be collected from the pump tubing using a slow, controlled pour down the side of a tilted sample vial to minimize volatilization. The sample vial will be filled until a meniscus is visible and immediately sealed. When the bottle is capped, it will be inverted and gently tapped to ensure air bubbles are not present in the vial. Vials with trapped air will be refilled until bubbles are not present. After the containers are sealed, sample degassing may cause bubbles to form. These bubbles will be left in the container. These samples will never be composited, homogenized, or filtered.

The following information will be recorded each time a direct push groundwater sample is collected:

- Sample identification,
- Date and time of sample collection,
- Sounded total depth of the well,
- Identity of samplers,
- Sampling methods and devices, and
- CoC protocols and records used to track samples from sampling point to analysis.

This information will be encoded into Environmental Resources Program Information Management System (ERPIMS) files when required.

6.1.9 Monitoring Well Groundwater Sampling

Before groundwater sampling begins, monitoring wells will be inspected for signs of tampering or other damage. If tampering is suspected, (i.e., casing is damaged, lock or cap is missing) this will be recorded in the field logbook and on the monitoring well sampling form, and reported to the

Field Supervisor. Monitoring wells that are suspected to have been tampered with will not be sampled until the Field Supervisor has discussed the matter with the Project Manager.

Water in the protective casing or in the vaults around the monitoring well casing will be removed prior to venting and purging. Every time a casing cap is removed to measure water level or collect a sample, the air in the breathing zone will be checked with a PID. Procedures in the *HASP* will be followed when high concentrations of organic vapors are detected. Air monitoring data will be recorded on the monitoring well sampling form.

Purge pump intakes will be equipped with a positive foot check valve to prevent purged water from flowing back into the monitoring well. Purging and sampling will be performed in a manner that minimizes aeration in the monitoring well bore and the agitation of sediments in the monitoring well and formation. Equipment will not be allowed to free-fall into a monitoring well.

6.1.9.1 Purging Prior to Sampling

Purging of monitoring wells is performed to evacuate water that has been stagnant in the monitoring well and may not be representative of the aquifer. Purging will be accomplished using a Teflon bailer or a pump. The temperature, pH, specific conductivity, and turbidity will be measured and recorded on the monitoring well sampling form after removing each well volume during purging.

Groundwater sampling methods for the on-site monitoring wells will follow protocols presented in the *Final SAP* (Earth Tech, 1994) that was prepared for the RI conducted at AFP 59 and the USEPA Resource Conservation and Recovery Act (RCRA) *Ground-Water Monitoring Technical Enforcement Guidance Document* (USEPA, 1986). The only change to the referenced protocols will be the calculation of the well bore volume (WBV). Under the referenced protocols, a WBV was calculated using the diameter of the auger/drill rod used to drill the borehole (in this case 8 inches). Under the revised protocol, the monitoring well casing diameter will be used to calculate the WBV.

Micropurge is an acceptable procedure to use for AFCEE projects that will be utilized for sampling off-site monitoring wells. Micropurge is a low flow-rate monitoring well purging and sampling method that induces laminar (non-turbulent) flow in the immediate vicinity of the sampling pump intake, thus drawing groundwater directly from the sampled aquifer horizontally through the monitoring well screen and into the sampling device. Low-flow pumping rates associated with the micropurge technique are in the approximate range of 0.2 to 0.5 liters per minute (L/min). These low-flow rates minimize disturbance in the screened aquifer, resulting in: (1) minimal production of artificial turbidity and oxidation, (2) minimal mixing of chemically distinct zones, (3) minimal loss of VOCs, and (4) collection of representative samples while minimizing purge volume.

6.1.9.2 Sample Collection

Except as noted below, at least three well volumes will be removed from the monitoring well before it is sampled or parameters are stable if the micropurge procedure is used. The sample may be collected after the temperature, pH, and specific conductivity have stabilized. Stabilization will be defined as follows: temperature ± 0.5 ^{o}C, pH ± 0.1 units, specific conductivity ± 3 percent, oxidation-reduction potential ± 10 millivolts, and turbidity ± 10 NTUs. Field equipment will be calibrated in accordance with Section 7.2.

Micropurge sampling will use bladder pumps (or equivalent). Samples to be analyzed for volatile or gaseous constituents will not be withdrawn with pumps or at flows that degas the samples. Water quality indicators will be monitored during micropurge (turbidity, dissolved oxygen, specific conductance, temperature, etc.).

Before collecting groundwater samples, the sampler will put on clean, phthalate-free protective gloves. Samples to be analyzed for volatile or gaseous constituents will not be withdrawn with pumps that exert a vacuum on the sample (e.g., centrifugal). New polypropylene tubing will be used for each well to prevent cross contamination. The preservative hydrochloric acid will be added to the VOC sample bottle before introducing the sample water. The sample will be collected from the pump tubing using a slow, controlled pour down the side of a tilted sample vial to minimize volatilization. The sample vial will be filled until a meniscus is visible and immediately sealed. When the bottle is capped, it will be inverted and gently tapped to ensure air bubbles are not present in the vial. Vials with trapped air will be refilled until bubbles are not present. After the containers are sealed, sample degassing may cause bubbles to form. These bubbles will be left in the container. These samples will never be composited, homogenized, or filtered.

The following information will be recorded each time a monitoring well is purged and sampled:

- Sample identification,
- Date and time of sample collection,
- Depth to water before and after purging,
- Well bore volume,
- Sounded total depth of the well,
- The condition of the well,
- Thickness of any non-aqueous layer,
- Field parameters such as pH, temperature, specific conductance, and turbidity,
- Identity of samplers,
- Sampling methods and devices, and
- CoC protocols and records used to track samples from sampling point to analysis.

This information will be encoded into Environmental Resources Program Information Management System (ERPIMS) files when required.

6.1.10 Soil Sampling

Soil samples will be collected using a 4-foot-long GeoProbe® MacroCore sampler with heavy duty, nonreactive acetate sleeves. A piston point at the tip of the sampler will prevent soil from entering the sampler while driving to the desired sample depth. When the desired sample depth is reached, the piston point will be withdrawn, and the sampler can be driven up to an additional 4 feet to collect the sample.

After sample collection, the acetate liner will be removed from the sampler and split open to expose the soil core. The soil will be screened with a PID and the PID readings and lithology will be recorded on a borehole log. A representative portion of the soil sample will be collected in laboratory-provided TerraCore™ samplers for analytical testing. The portion selected will be based on the depth of elevated PID readings or visual observation of staining. One 5 gram core will be collected and the core extruded into a 40-ml vial of sodium bisulfate. Another 5 gram core will be collected and the core extruded into a pre-tared 40-ml vial of methanol. A portion of the remaining soil sample will be placed in a 2 ounce jar to determine the percent moisture of the sample. The TerraCore™ samplers will be labeled prior to sample collection. Once collected, the soil samples will immediately be placed on ice in insulated coolers until delivery to the laboratory. Standard CoC protocol will be followed. The remaining portion of each soil sample will be containerized for proper IDW disposal.

The following information will be recorded for each direct push soil sample collected:

- Sample identification,
- Date and time of sample collection,
- Sampling depth,
- Identity of samplers,
- Sampling methods and devices, and
- CoC protocols and records used to track samples from sampling point to analysis.

6.1.11 Utility Clearance

The sample locations within the facility where intrusive activities occur will be cleared for utilities. Dig Safely New York and affected private utility companies will be notified of AECOM's work plans and as such, will identify their utilities to the point at which BAE assumes ownership. BAE facility personnel will mark utilities at the point where BAE assumes private ownership. Based on conversations with facilities personnel, BAE owns all of the affected utilities, and will mark all of the affected utilities.

6.1.12 Geotechnical Subsurface Characterization

Undisturbed soil samples will be collected for geotechnical analysis. The undisturbed soil samples will be analyzed for total organic carbon content (USEPA Method 9060); air permeability (ASTM D-4525); moisture content and density (ASTM D 2216 and D 2937); specific gravity (ASTM D-854); organic matter content (ASTM D-2974); Atterburg limits (ASTM D-4318); grain size distribution (ASTM D-2488); and USCS soil type classification.

The undisturbed soil sample will be collected in accordance with ASTM D1587 Standard Practice for Thin-walled Tube Sampling of Soils for Geotechnical Purposes. A Shelby tube will be advanced from 2 to 4 feet bgs. The Shelby tube will then be retrieved, sealed with paraffin wax, capped, and packaged for shipment to the laboratory.

The samples will be collected in 24-inch long by 2 3/8-inch inner diameter (I.D.) split-spoon samplers containing four 6-inch long by 2 3/8-inch I.D. stainless steel sample tubes.

6.2 SAMPLE HANDLING

6.2.1 Sample Containers

Sample containers are purchased precleaned and treated according to USEPA specifications for the methods. Sampling containers that are reused are decontaminated between uses by the USEPA-recommended procedures (i.e., USEPA 540/R-93/051). Containers are stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. Amber glass bottles are used routinely where glass containers are specified in the sampling protocol.

6.2.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the analytical methods performed on AFCEE samples are listed in Table 5.1.2-1 in Section 5.1.2 of the QAPP.

Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Holding times for methods required routinely for AFCEE work are specified in Table 5.1.2-1 in Section 5.1.2 of the QAPP. Samples not preserved or analyzed in accordance with these requirements shall be resampled and analyzed, at no additional cost to AFCEE.

6.3 SAMPLE CUSTODY

Samples collected for analysis at the off-site laboratories will be maintained under strict chain-of-custody procedures.

Procedures to ensure the custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in field and laboratory records.

The contractor shall maintain chain-of-custody records for all field and field QC samples. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession, (2) it is in their view after being in their possession, (3) it was in their possession and they locked it up, or (4) it is in a designated secure area.

The sample coolers shall be sealed in a manner that shall prevent or detect tampering if it occurs (through the use of custody seals). In no case shall tape be used to seal sample containers. Samples shall not be packaged with activated carbon unless prior approval is obtained from the AFCEE.

The following minimum information concerning the sample shall be documented on the AFCEE CoC form:

- Unique sample identification
- Date and time of sample collection

- Source of sample (including name, location, and sample type)
- Designation of MS/MSD
- Preservative used
- Analyses required
- Name of collector(s)
- Pertinent field data (pH, temperature, etc.)
- Serial numbers of custody seals and transportation cases (if used)
- Custody transfers signatures and dates and times of sample transfer from the field to transporters and to the laboratory or laboratories
- Bill of lading or transporter tracking number (if applicable)

The samples shall be uniquely identified, labeled, and documented in the field at the time of collection in accordance with Section 2.2.1 of the task specific work plan.

Samples collected in the field shall be transported to the laboratory or field testing site as expeditiously as possible. When a 4°C requirement for preserving the sample is indicated (for samples analyzed at the off-site laboratory), the samples shall be packed in ice or chemical refrigerant to keep them cool during collection and transportation. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. A temperature blank (a VOC sampling vial filled with water) shall be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory.

6.4 FIELD QUALITY CONTROL SAMPLES

6.4.1 Ambient Blank

The ambient blank consists of American Society for Testing and Materials (ASTM) Type II reagent grade water poured into a VOC sample vial at the sampling site. It is handled like an environmental sample and transported to the laboratory for analysis. Ambient blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes.

Ambient blanks are used to assess the potential introduction of contaminants from ambient sources (e.g., active runways, engine test cells, gasoline motors in operation, etc.) to the samples during sample collection. Ambient blanks shall be collected downwind of possible VOC sources. The frequency of collection for ambient blanks is specified in Section 2.2 of the task specific work plan.

6.4.2 Equipment Blank

An equipment blank is a sample of ASTM Type II reagent grade water poured into, over, or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. Equipment blanks are used to assess the effectiveness of equipment decontamination procedures. The frequency of collection for equipment blanks is specified in Section 2.2 of the task specific work plan. Equipment blanks shall be collected immediately after the equipment has been decontaminated. The blank shall be analyzed for all laboratory analyses requested for the environmental samples collected at the site.

6.4.3 Trip Blank

The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank shall accompany each cooler of samples sent to the laboratory for analysis of VOCs.

6.4.4 Field Duplicates

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The sample containers are assigned an identification number in the field such that they cannot be identified (blind duplicate) as duplicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field duplicate samples prior to the beginning of sample collection.

Duplicate sample results are used to assess precision of the sample collection process. Precision of soil samples to be analyzed for VOCs is assessed from collocated samples because the compositing process required to obtain uniform samples could result in loss of the compounds of interest. The frequency of collection for field duplicates is specified in Section 2.2 of the task specific work plan.

6.4.5 Field Replicates

A field replicate sample, also called a split, is a single sample divided into two equal parts for analysis. The sample containers are assigned a unique identification number in the field. Specific locations are designated for collection of field replicate samples prior to the beginning of sample collection.

Replicate sample results are used to assess precision. The frequency of collection for field replicates is specified in Section 2.2 of the task specific work plan.

7.0 FIELD MEASUREMENTS

7.1 PARAMETERS

Field measurements will include air monitoring to determine on-site health and safety protective measures and geophysical surveying to identify subsurface utilities. Health and safety-related air monitoring will be performed using a PID. Air monitoring activities related to health and safety protective measures are discussed in the *HASP*. Additional information on organic vapor screening is provided in Section 6.0 of the *QAPP*.

The geophysical surveying will be performed using some combination of ground penetrating radar, electromagnetic methods, and magnetometry. A subcontractor will decide which instruments are most appropriate for site conditions, be responsible for the maintenance of the instruments, and perform the geophysical surveying.

7.2 EQUIPMENT CALIBRATION AND QUALITY CONTROL

The air monitoring equipment shall be maintained and calibrated according to recommendations set forth by the manufacturer. At a minimum, all monitoring equipment will be calibrated at least daily, prior to initiation of field activities. The results of the calibration shall be entered into the field notebook, including instrument type, instrument serial number, calibration gas, fluid, etc., and concentration, and calibration results. The calibration of the field instruments shall be performed by a qualified individual. Additional information on air monitoring equipment calibration is contained in the *HASP*. Equipment that is out of calibration will be returned to the rental subcontractor for recalibration by a qualified technician.

The geophysical surveying subcontractor shall be responsible for the calibration of the geophysical surveying instruments.

7.3 EQUIPMENT MAINTENANCE AND DECONTAMINATION

It is not expected that air monitoring or geophysical surveying equipment will come into direct contact with groundwater samples. Upon completion of sampling or surveying at a location, the instruments shall be wiped with clean paper towels to remove any dust that may have accumulated.

7.4 FIELD MONITORING MEASUREMENTS

7.4.1 Groundwater Level Measurements

Water-level measurements may be taken in the sampled monitoring wells. Any conditions that may affect water levels shall be recorded in the field log. Water-level measurements will be collected within the same time interval to evaluate groundwater flow.

Water-level measurements shall be taken with electric sounders. Devices that may alter sample composition shall not be used. All measuring equipment shall be decontaminated according to the specifications in Section 5.6. Ground-water level shall be measured to the nearest 0.01 foot. (Two or more sequential measurements shall be taken at each location until two measurements agree to within ± 0.01 foot.)

If the casing cap is airtight, time will be allowed prior to measurement for equilibration of pressures after the cap is removed. Measurements will be repeated until the water level has stabilized.

8.0 RECORD KEEPING

The contractor shall maintain field records sufficient to recreate all sampling and measurement activities and to meet all Installation Restoration Program Information Management System data loading requirements. The requirements listed in this section apply to all measuring and sampling activities. Requirements specific to individual activities are listed in the section that addresses each activity. The information shall be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages. These records shall be archived in an easily accessible form and made available to the USAF upon request.

The following information shall be recorded for all field activities: (1) location, (2) date and time, (3) identity of people performing activity, and (4) weather conditions. For field measurements: (1) the numerical value and units of each measurement, and (2) the identity of and calibration results for each field instrument, shall also be recorded.

The following additional information shall be recorded for all sampling activities: (1) sample type and sampling method; (2) the identity of each sample and depth(s), where applicable, from which it was collected; (3) the amount of each sample; (4) sample description (e.g., color, odor, clarity); (5) identification of sampling devices; and (6) identification of conditions that might affect the representativeness of a sample (e.g., refueling operations, damaged casing).

If an error is made on an accountable document assigned to one individual, that individual may make corrections simply by crossing a single line through the error and entering the correct information. The erroneous information should not be obliterated. The person who made the entry should correct any subsequent error discovered on an accountable document. The subsequent corrections must be initialed and dated.

9.0 REFERENCES

Earth Tech, Inc. 1994. *Final Sampling and Analysis Plan.*

———. 2006. *Final Soil Vapor Study and LTM Work Plan.*

New York State Department of Environmental Conservation. 2002. *Draft Technical Guidance for Site Investigation and Remediation.*

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

United States Environmental Protection Agency (USEPA). 1986. RCRA *Ground-Water Monitoring Technical Enforcement Guidance Document.*

———. 1994. *Guidance for the Data Quality Objectives Process (Final)* EPA QA/G-4.