RECONNAISSANCE SURVEY PLANNED FIELD ACTIVITIES AIR FORCE PLANT 59 JOHNSON CITY, NEW YORK

1.0 INTRODUCTION

The Earth Technology Corporation will be conducting an environmental investigation for the U.S. Air Force at Air Force Plant (AFP) 59 in Johnson City, New York as part of the Installation Restoration Program (IRP). The IRP was developed by the Department of Defense (DoD) in 1983 to investigate hazardous material disposal sites on DoD facilities. Three IRP investigations, including a records search, have been conducted to date at AFP 59.

This document describes the planned field activities at AFP 59 for the first phase of investigation. The first phase will be a reconnaissance survey which will be used to guide the second phase of the field investigation. A Work Plan and Sampling and Analysis Plan for the entire investigation will be prepared prior to initiation of any additional field work required for the second phase of work. All work will be conducted in accordance with the requirements of the "Handbook for the Installation Restoration Program (IRP) Remedial Investigations and Feasibility Studies (RI/FS)" (USAF, September 1993), hereinafter referred to as the Handbook. The reconnaissance survey is scheduled to be conducted in July 1994.

1.1 Site History

AFP 59 is located in the Village of Johnson City, New York and occupies 29.6 acres (see Figure 1). The main manufacturing building was constructed in 1942. Aluminum propellers were manufactured at the facility from 1942 to 1945. The facility was operated by General Electric (GE) Aerospace beginning in 1949 and has manufactured aircraft controls. In April 1993, Martin Marietta Aircraft Controls acquired GE Aerospace and took over operation of the facility.

AFP 59 is listed as a Class 2 Site on the New York State Department of Environmental Conservation (NYSDEC) List of Inactive Hazardous Waste Disposal Sites (Site Code 7-04-020). A Class 2 Site is categorized as posing a "significant threat to the public health or environmental action required." The aquifer which underlies AFP 59 has been designated a sole-source aquifer by the Environmental Protection Agency (EPA) since it supplies drinking water to the area's 128,000 residents. The aquifer is locally separated into two zones (shallow and deep) separated by discontinuous lakebed deposits. In general, glacial outwash deposits make up the shallow zone of the aquifer and ice-contact deposits make up the deep zone of the aquifer.

The Camden Street Wellfield, a Johnson City municipal wellfield, is located approximately 1,000 feet southwest of the plant's boundary. At the wellfield, 1,1,1-trichloroethane (TCA) has been detected at concentrations exceeding the New York maximum contaminant level (MCL) of 5 μg/L. An air stripper was installed at the wellfield by Johnson City in June 1992. The Air Force voluntarily entered into a Memorandum of Understanding (MOU) with Johnson City to provide partial financial support, subject to the availability of funds, for the operation of the air stripper. The MOU does not constitute a finding by the State of New York or Johnson City that AFP 59 is a source of the wellfield contamination.

Several potential source areas have been identified at AFP 59 and have been investigated during previous IRP investigations (see Figure 2). These areas include underground waste oil storage tanks, a drum storage area, a plating operations building, a storage tank and settling pond, a former gasoline storage tank, a piping area, and an abandoned oil/water separator. Chlorinated hydrocarbons have been detected in groundwater at AFP 59. During the most recent investigation, a Supplemental Site Inspection, trichloroethene (TCE) was detected at a maximum concentration of 97 μg/L in groundwater from a well near the plating room, and TCA was detected at a maximum concentration of 15.2 μg/L in groundwater from a well near the southwestern corner of the property. TCE and TCA were only detected in three soil samples collected during this investigation; two of the soil samples were from the same locations where the maximum concentrations were detected in groundwater. Other chlorinated compounds detected in groundwater include 1,1-dichloroethane, 1,1-dichloroethene, and tetrachloroethene.

1.2 Project Objectives

A primary objective of the Air Force is to determine the potential contribution of past or present activities at AFP 59 to the groundwater contamination identified at the Camden Street Wellfield. To accomplish this task, potential onsite sources of contamination must be investigated. Additionally, potential offsite sources of contamination that could be contributing to the wellfield contamination must be identified. The focus of the planned activities for the reconnaissance survey is an investigation of potential onsite sources and further definition of the extent of contamination. An investigation of potential offsite sources of contamination will be conducted by the United States Geological Survey (USGS). These two investigations have been designed to include complementary activities to avoid duplication of effort and to maximize data collection capabilities.

The following project objectives have been identified for the investigation at AFP 59.

- Identify potential onsite sources of soil and/or groundwater contamination.
- Define the nature and extent of onsite groundwater contamination in the shallow and deep zones of the aquifer.
- Define the nature and extent of soil contamination.

- Define background concentrations of both metals and organics in soil, sediment, surface water, and groundwater to determine potential contributions of upgradient sources of contamination.

- Identify migration pathways, including the degree of interconnection between the shallow and deep zones of the aquifer.

- Determine the relationship of any identified contamination at AFP 59 to contamination at municipal wells.

- Refine the conceptual site model, including source identification and contaminant migration.

- Meet the requirements of CERCLA 120(h) to allow transfer of the property.

1.3 Investigative Approach

Earth Tech will conduct the field investigation using a phased approach in order to efficiently characterize the site. The first phase of the investigation, a reconnaissance survey of AFP 59, will consist of: a geophysical clearance survey; soil and groundwater sampling; onsite analyses for screening; offsite analyses for site characterization; water level measurements in existing monitoring wells; groundwater quality screening at selected existing monitoring wells; and a pump test. Soil and groundwater samples will be collected using a direct push sampling technique and analyzed at an onsite mobile laboratory for volatile organic compounds (VOCs). The screening data will be used to locate potential source areas and delineate areas of contamination. Selected soil samples will also be sent offsite for analysis at a fixed laboratory to provide data for site characterization, including definition of background. A synoptic round of water level measurements will be obtained prior to the pump test to obtain data to generate a potentiometric map and determine groundwater flow directions. The aquifer pump test will be conducted to determine the degree of interconnection between the upper and lower zones of the aquifer.

The data collected during the reconnaissance survey will be used to guide the second phase of the field investigation. Only the activities to be completed during the first phase are described in this plan; a Work Plan and Sampling and Analysis Plan will be prepared prior to initiation of the second phase of investigation. Anticipated field tasks during the second phase include monitoring well installation, subsurface soil sampling, groundwater sampling, water level measurements, surface water sampling, and sediment sampling. Sampling locations will be determined based on the results of the direct push sampling, and monitoring well design and construction will be based on the results of the aquifer pump test.

2.0 FIELD INVESTIGATION

The field activities planned for the first phase of the investigation at AFP 59, the reconnaissance survey, are described below.

2.1 Direct Push Soil And Groundwater Sampling and Analysis

Objectives

The direct push soil and groundwater sampling and analysis program is designed to provide a real time analysis of the site to define any contaminant plumes and potential sources. Additionally, the direct push soil and groundwater sampling will assist in the placement of monitoring wells during the second phase of the field program. The objectives of the reconnaissance survey are to investigate potential source areas and migration pathways; delineate the extent of soil and groundwater contamination; and further define background concentrations of VOCs and metals in soil. Additional information on the subsurface lithology will also be collected during the soil sampling. In addition to the direct push samples, groundwater samples will be collected from selected existing monitoring wells and analyzed at the onsite mobile laboratory. These data will provide updated information on the existing groundwater quality at the site.

Field Sampling Locations

Initially, soil and groundwater samples will be collected at the approximate locations shown in Figure 3. The sampling locations were selected to generally characterize the site and investigate potential sources and migration pathways. Additional sampling locations to more completely characterize the site will be determined based on the results of the initial samples. Potential additional sampling locations are also shown in Figure 3. Any of the proposed sampling locations may be modified depending on site conditions and results of earlier samples. Direct push sampling locations are along drains, in the plating room, near the reservoir, and along the perimeter of the plant. These locations were chosen to further define contamination in the vicinity of the plating room and investigate potential migration pathways which contaminants may have followed, such as subsurface drains. Locations along the perimeter of the plant were chosen to provide background concentrations and determine if contamination is moving onsite from offsite, upgradient locations. In general, the sampling grid is more closely spaced in areas where the greatest data resolution is required. Sampling locations will be measured and tied to surveyed locations at the plant for reference. All locations will be recorded on a site map that is accurate and to scale.

Prior to sampling any of the locations, Earth Tech will conduct a geophysical survey clearance to determine the locations of underground utilities or other objects buried beneath the ground surface. The geophysical methods used for the clearance will be electromagnetic imaging (EMI), ground penetrating radar (GPR), and magnetic profiling. Site utility maps will be used in conjunction with these three methods to locate buried utilities. These complementary techniques will be used because underground utilities are made of many different materials (ferrous steel, aluminum, polyvinyl chloride, and ceramic). EMI profiling can detect changes in electrical properties due to changes in soil conductivity related to changing soil types, groundwater, or anthropogenic metal objects. EMI has an effective penetration depth of about 8 feet. GPR responds to changes in dielectric properties and is usually effective to approximately 10 feet. Magnetic profiling can detect steel and iron objects and has an effective penetration depth of approximately 10 feet.

Sampling Procedures

Target Environmental Services Inc. will perform the direct push soil and groundwater sampling and will provide all necessary equipment. Earth Tech field team members will supervise the collection of samples at each location. Soil samples will be collected by hydraulically driving a 1.25-inch diameter, 2-foot long piston-type sampler to the top of the desired sampling interval. The piston will then be released, allowing soil to be collected in a non-reactive plastic or stainless steel liner. The drive rod will be pushed through a 2-foot soil interval as the core enters the sampler. The sampler and drive rod are then removed from the soil along with the liner containing the sample.

To collect groundwater samples, a hydraulic probe will be used to drive 1.25-inch diameter steel pipe to the prescribed depth. The bottom of the pipe will be opened or the pipe will be replaced with a slotted PVC pipe to allow water to enter from the soil. Target will collect a groundwater sample with a teflon sampling tube or a stainless steel mini-bailer lowered through the steel pipe.

At each location, a two foot composite soil sample will be collected every 5 feet until groundwater is reached (approximately 15-20 feet bgs). An Earth Tech field team member will use a photo-ionization detector (PID) to screen each sample for organic vapors in the field. The sample liners containing the soil will then be capped and stored in a cooler at 4°C. The soil sample at each location with the highest PID reading will be taken to the onsite laboratory and analyzed for VOCs. If none of the samples from a location have elevated PID readings, the sample closest to the groundwater table will be analyzed onsite for VOCs. Based on the results of the onsite analysis, some of the samples which were retained and maintained at 4°C may be sent to a fixed laboratory for confirmation and quantification of VOCs. In addition, approximately 10% of the soil samples will be sent to a fixed laboratory for metals analysis. The soil samples chosen for metals analysis will be background samples as well as samples from areas where metals contamination is suspected based on previous investigations. Section 3.0 provides more details on the fixed laboratory analytical program.

At each sampling location, a groundwater sample will be collected from the shallow water-bearing zone and analyzed onsite for VOCs. Grab samples of selected existing monitoring wells will also be collected during the reconnaissance survey and analyzed onsite for VOCs. Two groundwater samples will be split and analyzed for VOCs at both the onsite (mobile) and offsite (fixed) laboratories: one sample from a location estimated to have a high concentration of VOCs and one sample from a location estimated to have a low concentration of VOCs. The split sample groundwater analysis will allow a comparison of the mobile and fixed laboratory results. This will provide an indication of the accuracy of the onsite mobile laboratory and the limits of the sampling protocol. A description of Target Environmental Services' sampling procedures is presented in Appendix A.

Analytical Procedures

Onsite sample analysis for VOCs will be performed by a subcontractor with a mobile laboratory. A laboratory-grade gas chromatograph equipped with an electron capture detector (ECD) and a flame-ionization detector (FID) for halocarbon detection will be used for sample analysis. The samples will be analyzed following modified EPA Method 3810/8010/8020. Analytical equipment shall be operated by a qualified, experienced chemist.

Initially, the analytical equipment will be calibrated and a three-point least squares linear regression calibration curve will be generated. The correlation coefficients will be examined for each standardized analyte and must be greater than 0.99. Following the initial three-point calibration, check standards will be analyzed at the beginning and end of each day to ensure retention time and response stability. In addition, lab blank analyses will be performed every tenth sample to assure a contaminant-free sampling system. Replicate analyses will be performed on at least every tenth sample and matrix spikes on every twentieth sample. Equipment rinseate blanks will be collected at the beginning and end of each day. The following compounds will be analyzed by a laboratory-grade gas chromatograph.

- 1,1-dichloroethane (1,1-DCA)
- 1,1-dichloroethene (1,1-DCE)/trichlorofluoroethane (TCTFA)
- cis-1,2-dichloroethene (c-1,2-DCE)
- trans-1,2-dichloroethene (t-1,2-DCE)
- 1,1,1-trichloroethane (1,1,1-TCA)
- 1,1,2-trichloroethane (1,1,2-TCA)
- trichloroethene (TCE)
- tetrachloroethene (PCE)
- carbon tetrachloride (CCl_4)/1,2-dichloroethane (1,2-DCA)
- methylene chloride
- chloroform
- vinyl chloride
- acetone
- total FID volatiles

The co-eluting pairs given above (1,1-DCE/TCTFA and CCl_4/1,2-DCA) will be reported in concentrations of 1,1-DCE and CCl_4, respectively.

Quality Assurance/Quality Control

The following Quality Assurance/Quality Control procedures will be followed during the direct push sampling and analysis program.

- A replicate analysis will be conducted on every tenth sample.

- Lab blanks will be analyzed every tenth sample.

- Check standards will be run at the beginning and end of each day.

- Matrix spikes will be performed on every twentieth sample.

- Equipment rinseate blanks will be collected and analyzed at the beginning and end of each day.

- Two groundwater samples will be split and analyzed at both the onsite (mobile) and offsite (fixed) laboratory to compare the results.

- Calibration of onsite analytical equipment will be performed daily, as well as daily calibrations of the PID used for field screening.

- All equipment will be decontaminated between sample locations.

2.2 Aquifer Pump Test

This section describes the potentiometric surface gaging and aquifer testing planned by Earth Tech for the reconnaissance survey at AFP 59. Previous studies have described the complex hydrogeology and groundwater flow directions in the underlying Clinton Street-Ballpark aquifer under various aquifer stress conditions. The previous aquifer stress models considered the influences from various production wells completed in the underlying aquifer at onsite and nearby offsite locations. The most significant of these production wells are Johnson City municipal water wells #1, #2, and #3 at the Camden Street Wellfield, located west of AFP 59 (see Figure 4). Due to the historical high volume withdrawal rate from these wells, it is likely that the most representative hydraulic conditions at AFP 59 occur while these wells are pumping. Municipal well #2 is currently the only well in use at the Camden Street Wellfield. Since 1992, the monthly pumpage rate from municipal well #2 has ranged from 32,471,000 gallons to 95,493,000 gallons. The well was idle for several months in 1993 while maintenance on the air stripper was performed. The prevalent groundwater gradient may also be affected by periodic usage of the onsite production well. In addition, the groundwater gradient is reported to be influenced by recharge from an adjacent tributary, Little Choconut Creek. The proposed potentiometric gaging and aquifer testing is designed to further define the prevalent hydraulic conditions in the underlying aquifer at AFP 59.

Objectives

The objectives of the potentiometric surface gaging and aquifer testing are to define the most representative hydraulic conditions at AFP 59. The information will be utilized to optimize placement and design of monitoring wells to be installed during the second phase of the investigation. A groundwater gradient map will also be generated from the data, and groundwater flow directions will be determined. The aquifer test will provide information on the connection between the upper and lower zones of the aquifer; the effect of pumping on Little Choconut Creek; and the potential presence and extent of any semi-confining layers (lakebed deposits).

Scope

A constant-rate pumping test will be conducted using the onsite production well as the pumping well and existing onsite and offsite monitoring wells as observation wells. Little Choconut Creek will also be monitored if there is sufficient flow in the creek, to determine possible communication between the creek and the aquifer. The basic procedures which will be utilized are described below.

1. Measure the static water levels in all accessible wells both onsite and offsite, and in Little Choconut Creek (see Figure 4). Stream gaging stations will be established to provide surface water levels. The static water level gaging will be conducted concurrent with pumpage from Johnson City Municipal Well #2.

2. Begin pumping the onsite production well at the optimum discharge rate determined by a review of plant usage of the well. Pump the production well continuously for 8 hours and maintain a constant discharge rate, if possible. Water will be discharged to the plant's non-contact cooling system as required for production; excess water will be discharged to the outfall.

3. Measure the drawdown at the intervals indicated on the attached Table 1 for the pumping well and Table 2 for observation wells and stream gaging. Record the data on the Aquifer Test Data Sheet (Form A). Pressure transducers will be installed at two well pair locations, and water level measurements will be recorded with a data logger. The data logger will provide more accurate data and can record water levels at more frequent intervals. The water levels at all other locations will be measured manually.

4. Turn the pump off and record the water level recovery of the aquifer until the water level has reached its approximate initial static level, or for the same length of time the pumping test was conducted. Measurement intervals for recovery tests will be the same as for the drawdown tests.

There are several methods available for calculating aquifer parameters using data from constant rate discharge tests. The applicable methods depend on how long the test is run, whether the aquifer is confined or unconfined, whether there are any noticeable boundary conditions, and if observation wells are used.

3.0 Fixed Laboratory Analytical Program

Approximately 10 percent of the soil samples collected during the direct push sampling will be sent offsite to a fixed laboratory for metals analyses. The following methods will be used in the detection of metals: SW6010 (ICP metals), SW7060 (arsenic), SW7421 (lead), SW7471 (mercury), SW7740 (selenium), and SW7841 (thallium). In addition, an offsite fixed laboratory will confirm and quantify VOCs by method SW8240 or SW8260 for soil samples from locations where VOCs were detected by the onsite mobile laboratory. Two groundwater samples will be analyzed by Method SW8260 at a fixed laboratory and at the onsite laboratory to provide a comparison of results obtained by the two analytical programs.

Ten percent of the soil samples sent offsite for analysis will be replicates. Trip blanks will be included with every cooler containing samples for VOC analysis. Equipment blanks for soil sampling will be collected every day and sent to the fixed laboratory for analysis only if any soil samples collected on that day are sent to the fixed laboratory for analysis. The equipment blanks will be analyzed by the same methods as the associated samples.

TABLE 1. RECOMMENDED TIME INTERVALS FOR MEASURING DRAWDOWN IN THE PUMPED WELL DURING A PUMPING TEST

Time Since Pumping Started (or Stopped) (in minutes)	Intervals Between Measurements (in minutes)
0 - 10	0.5 - 1
10 - 15	1
15 - 60	5
60 - 300	30
300 - 480	60

TABLE 2. RECOMMENDED TIME INTERVALS FOR MEASURING DRAWDOWN IN THE OBSERVATION WELL(S) DURING A PUMPING TEST

Time Since Pumping Started (or Stopped) (in minutes)	Intervals Between Measurements (in minutes)
0 - 10	2
60 - 120	5
120 - 240	10
240 - 360	30
360 - 480	60

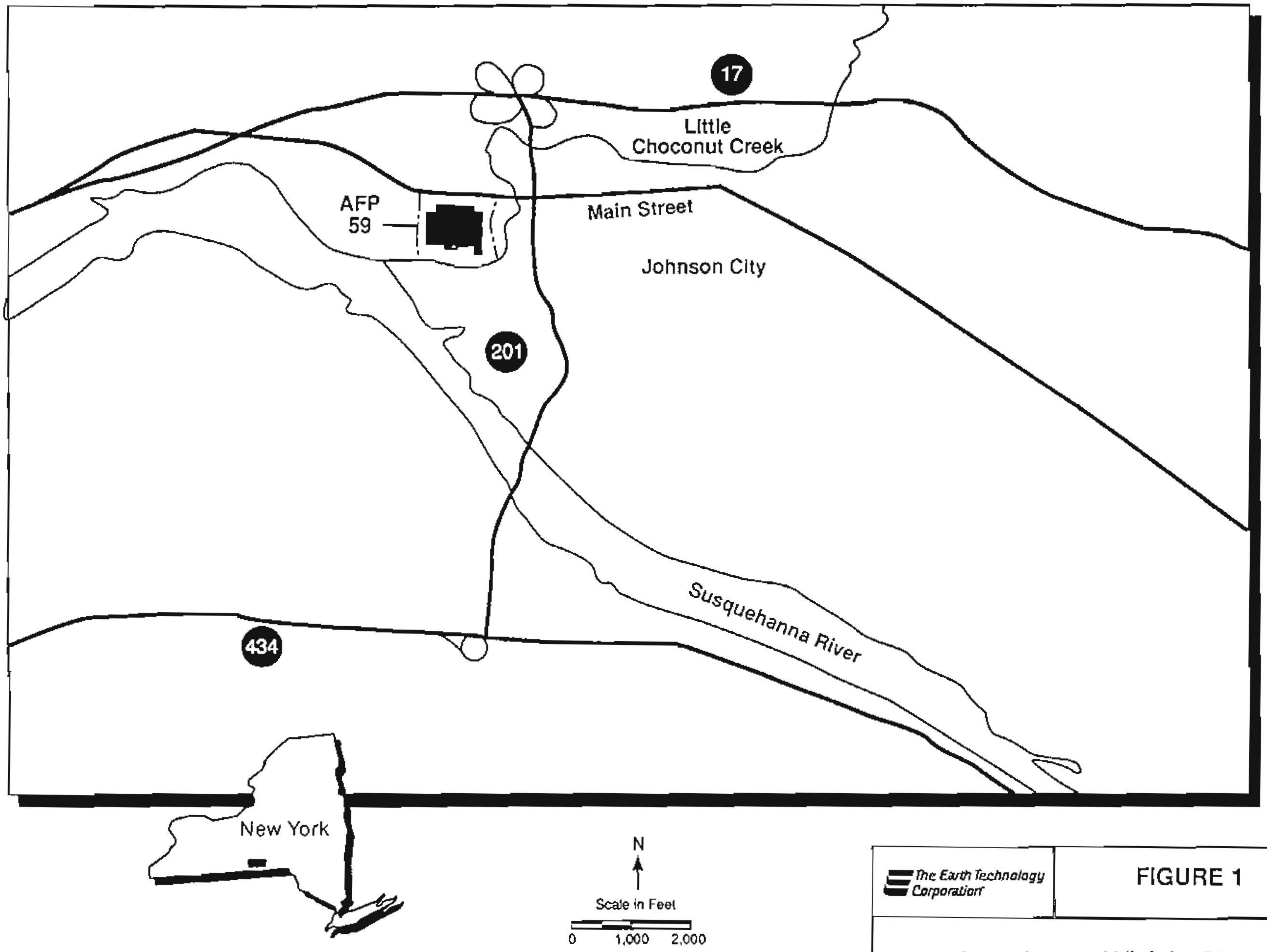
The laboratory performing the offsite analyses will be both AFCEE certified and New York State certified. The analyses will incorporate all QA/AC procedures defined in the analytical methods and the Handbook. Data will be reported at Air Force Level II (EPA Level III). Installation Restoration Program Information Management System (IRPIMS) files will be generated by the laboratory in addition to the hard copy reports.

4.0 REPORTING

The results of the reconnaissance survey will be provided in a letter report. At a minimum, this report will include:

- Sampling locations
- Sampling procedures
- Analyses performed
- Summary analytical results
- Aquifer test results.

The results of the first phase of the field investigation will be used in planning the second phase of the investigation. Additional sampling locations, such as monitoring wells, will be determined based on the results obtained during the screening. Upon completion of the second phase of the investigation, all results, including the reconnaissance survey results, will be incorporated into a comprehensive technical report.



The Earth Technology Corporation

FIGURE 1

Location and Vicinity Map of AFP 59

QF/AFP 59/LOC & VICINITY

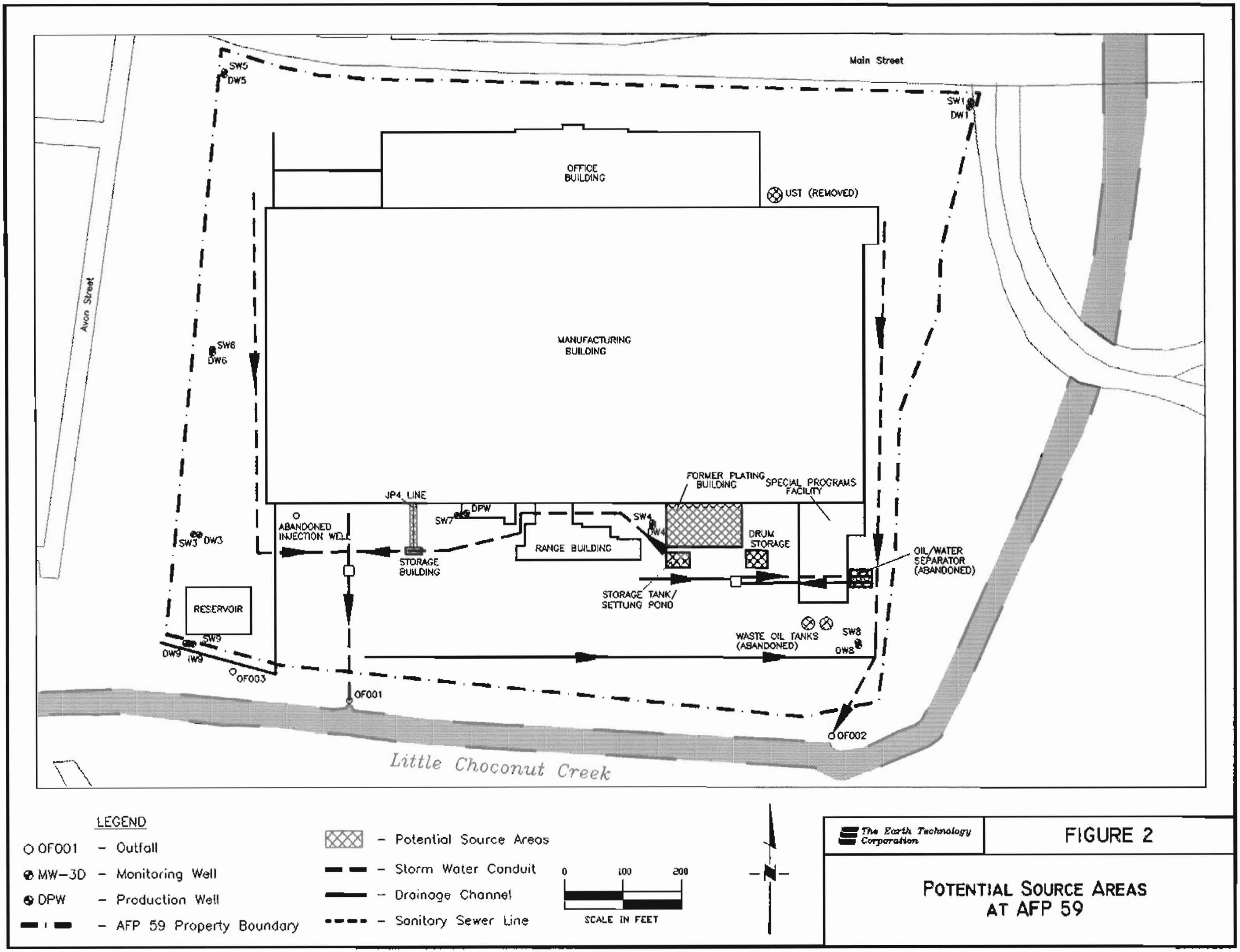
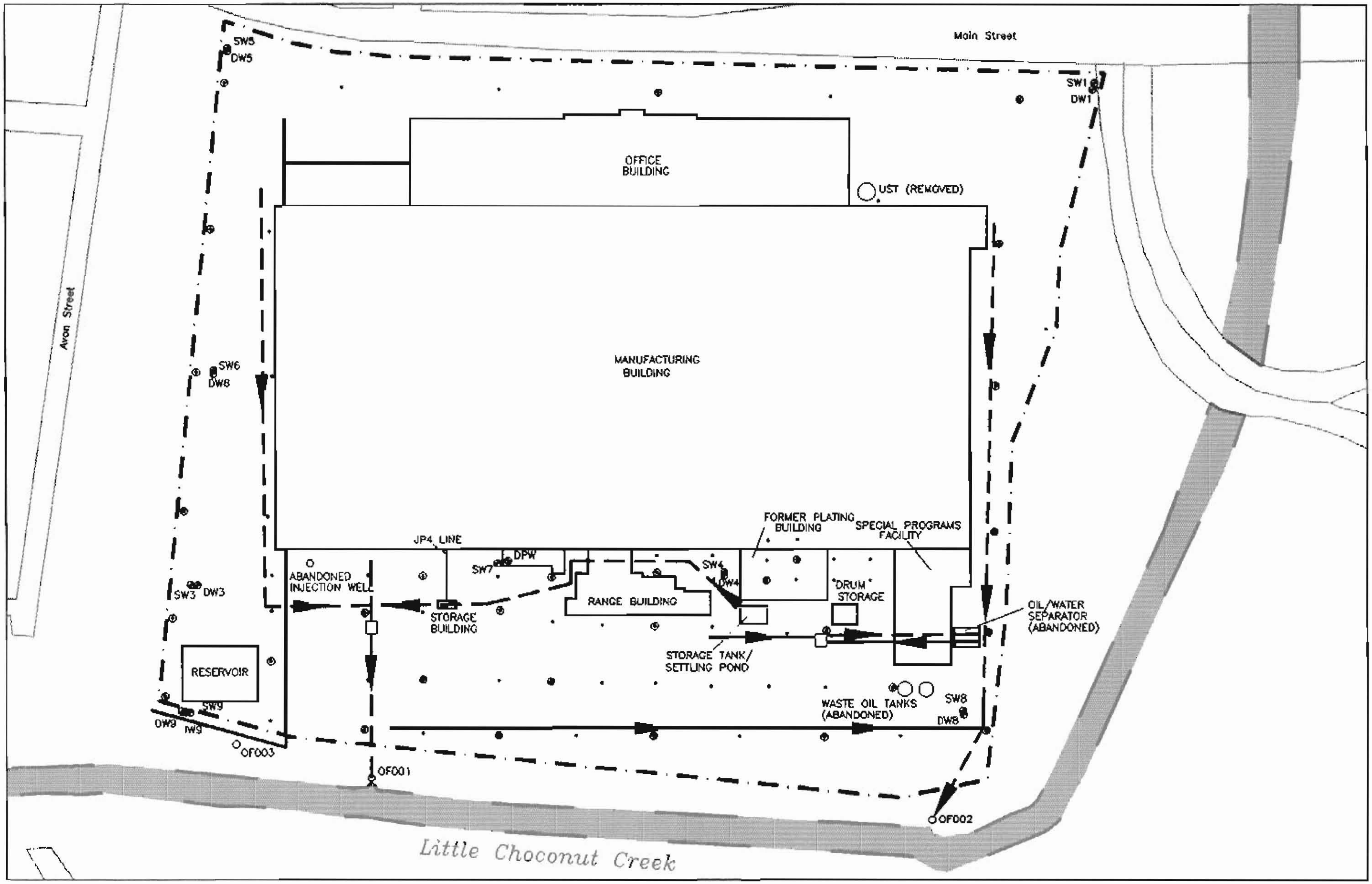


FIGURE 2

POTENTIAL SOURCE AREAS AT AFP 59



LEGEND

○ OF001 – Outfall

● MW-3D – Monitoring Well

● DPW – Production Well

▬ · ▬ – AFP 59 Property Boundary

- - - - – Sanitary Sewer Line

⊙ – Proposed Sampling Location

· – Potential Additional Sampling Location

— — – Storm Water Conduit

—— – Drainage Channel

0 100 200

SCALE IN FEET

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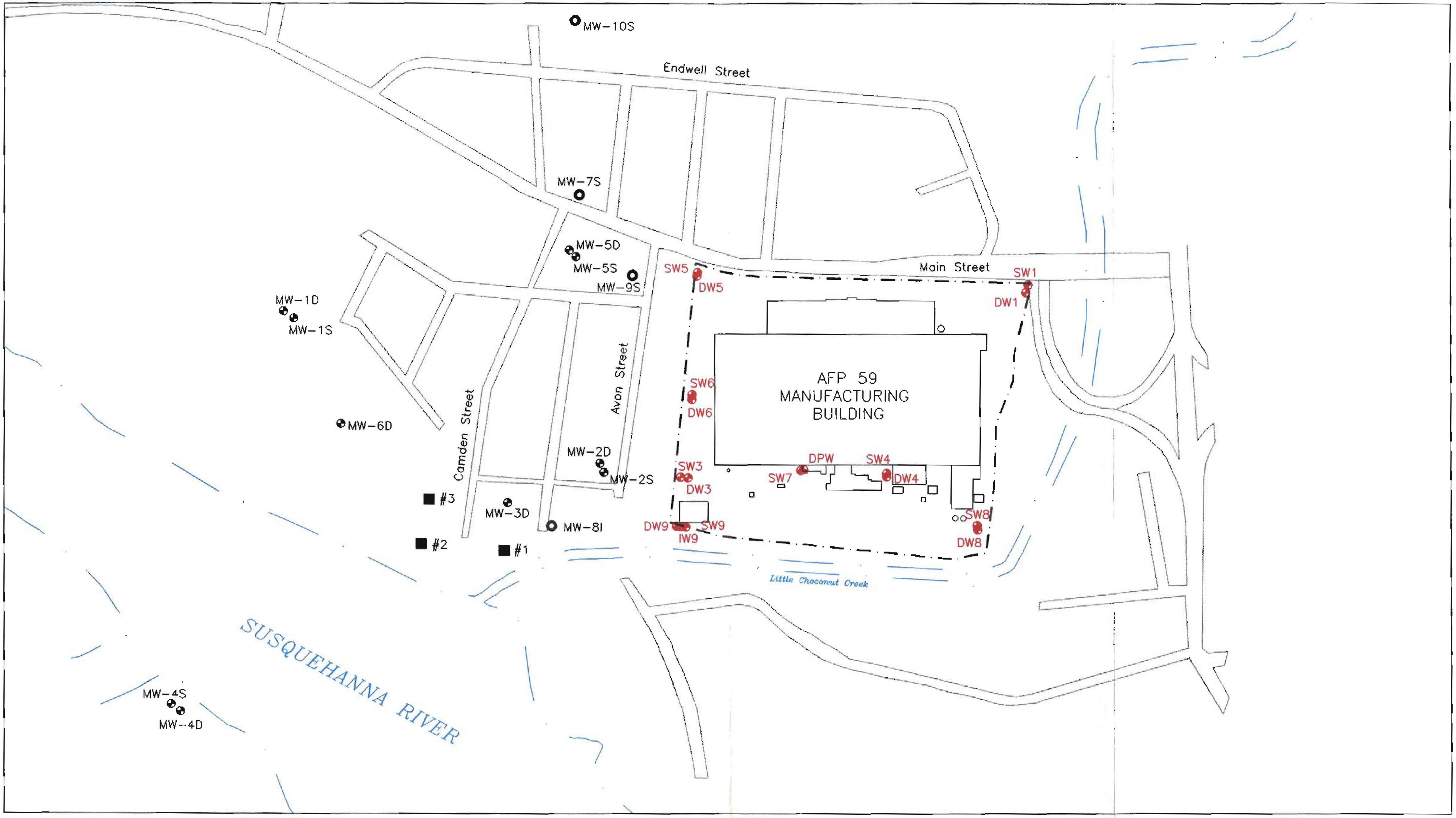
FIGURE 3

PROPOSED DIRECT PUSH SAMPLING LOCATIONS



LEGEND

● MW-3D – NYSDEC Monitoring Well (Installed 1991)

○ MW-8I – NYSDEC Monitoring Well (Installed 1992)

■ #1 – Johnson City Water Supply Well

● SW7 – AFP 59 Monitoring Well

— · — – AFP 59 Property Boundary

0 170 340
SCALE IN FEET

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FIGURE 4

EXISTING
WELL LOCATIONS

APPENDIX A

QUALITY ASSURANCE PLAN
for
ANALYTICAL SERVICES

Prepared for

THE EARTH TECHNOLOGY CORPORATION
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Prepared by
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1.0 Project Description

Direct push collection and analysis of samples from the shallow subsurface will provide data on the identity and concentrations of any volatile organic compounds which may be present, without generating waste from soil cuttings.

Samples will be analyzed on a laboratory-grade gas chromatograph equipped with capillary columns, thermal oven, and with a data processor and associated hardware. Each instrument is appropriately calibrated at the beginning of the project, and as needed for the duration of the project using an instrument-response curve and injection of standards of known concentrations. Calibration checks will be performed at a minimum of twice a day. Retention times of the compounds in the standards are used to identify the unknown compounds in field samples, and their response factors are used in calculating actual concentrations. Replicate analyses will be performed on at least every tenth field sample (see Section 8.0).

Sometimes, more than one compound will elute at the same retention time. When this happens, the results will be reported as a coelutant pair. If further resolution is desired, a representative sample from any given area of interest will be selected for analysis by GC/MS. All GC/MS analyses will be performed by **Maryland Spectral Services, Inc.**, Baltimore, Maryland.

The results of the analyses will be interpreted and reported by TARGET in the form of a written report including a summary of background information, descriptions of sampling and analytical procedures, tabulated analytical results (including QA/QC), a scaled base map with labelled sample locations, contoured maps (as appropriate) of individual component concentrations, and a discussion and interpretation of the findings.

2.0 Project Personnel

TIMOTHY W. NIBLETT is Senior Project Manager for TARGET. Mr Niblett's responsibilities include scheduling, coordinating and organizing field activities for client projects. He works directly with clients and other TARGET project managers to determine the project background and client needs. From this, he designs the site survey to fulfill the specified requirements of the client, while working closely with TARGET's Health and Safety Officer to address the health and safety issues on each project site. Mr. Niblett has extensive experience in soil gas sampling and has worked with other senior field management to develop the company's strict sample acquisition and QA/QC field procedures. Mr. Niblett is responsible for coordinating all field scheduling (equipment and personnel) and has the authority to commit company personnel and resources to individual projects. Mr. Niblett has a B.S. in Environmental and Natural Science

ELIZABETH J. TIERNEY is Laboratory Director at TARGET. She is responsible for directing all in-house laboratory operations, including overseeing the maintenance and calibration of various gas chromatographs and the development and implementation of methods for new chromatographic technologies. Before TARGET, she was employed in the GC-MS Laboratory for the State of Maryland Department of Health and Human Hygiene. Dr. Tierney received a Ph.D. in Chemistry from the University of Maryland and a B.S. in Chemistry from Fairfield University.

GUY AULD is currently Manager of TARGET's Report Writing Department. As senior data review analyst, Mr. Auld is responsible for the overall quality, accuracy and completeness of laboratory data. He also performs the correction and hand contouring of TARGET's computer generated isoconcentration maps, directs the interpretation of results and the integration of data sets, as well as the compilation and preparation of TARGET's comprehensive written reports. Prior to working in the Report Writing Department, he was a Project Manager at TARGET and he worked in the field as a Field Consultant. This experience has helped him to understand all phases of the projects and to compile detailed reports of the work. Mr. Auld has a BS in Geology from the University of Maryland, College Park (1987).

MICHAEL MARRALE is a In-Field Analysis Coordinator for TARGET's Columbia office, the California Regional Office, and the St. Louis/Dallas Regional Office. He is responsible for the daily operations of the mobile laboratories as well as maintaining standard operating procedures and quality assurance/quality control procedures for field analysis. Mr. Marrale has a B.A in Environmental Science from the University of Virginia.

3.0 Quality Assurance Objectives

3.1 Precision

Precision will be assessed by the comparison of replicate analyses. A replicate analysis will be conducted on every tenth sample (10%). The variation between replicate analysis must be equal to or less than 20%.

3.2 Accuracy

Accuracy will be determined by the analysis of lab blanks, check standards and matrix spikes. Retention times of the compounds in the standards are used to identify the unknown compounds in field samples, and their response factors are used in calculating actual concentrations. Accuracy will be estimated by comparing of measured check standard concentrations of each analyte with known concentrations in the stock standard and comparing the results of duplicate analyses. Matrix spikes will be used to determine the effect of the matrix on the analyte recovery. The percent recovery must be within 50 to 150%. The data quality objective with respect to field and lab blanks is to achieve analytical concentrations below the quantification limit for all analytes. Lab blanks will be analyzed after every tenth sample. Check standards will be run at the beginning of the day and at the end of the day. Replicate analyses will be performed on at least every tenth field sample. Matrix spikes will be performed on every twentieth field sample. In addition, equipment rinseate blanks will be collected and analyzed at the beginning and end of each day.

When contamination is determined to be present in a lab or rinseate blank, an assessment as to the effect of the contamination on the validity of the data from any field sample locations will be made. If necessary, field samples will be recollected from the affected areas and appropriate notations will be made in the field books.

4.3 Representativeness

Representativeness of data collection should be addressed by careful preparation of the sampling program. A sufficient number, frequency and location of samples, must be chosen to assure that sample data accurately and precisely represent selected characteristics of the samples.

4.0 Laboratory Support Facilities

The primary operation of **TARGET**'s laboratory is to analyze soil gas/vapor/air samples. **TARGET** operates ten Shimadzu gas chromatographs, equipped with auto samplers, flame-ionization detector (FID), electron capture detector (ECD), and computerized data systems, which are dedicated to the 24-hour analysis of vapor samples. Each GC can routinely analyze 50 vapor samples/day under standard run parameters. Providing allowances for equipment maintenance and additional processing for highly contaminated samples, the laboratory can analyze approximately 1,200 samples/week. The laboratory is also equipped to analyze soil and water samples by purge and trap utilizing GC/PID (photo-ionization detector) and Hall detector. **TARGET**'s infield laboratories use the same equipment found in the fixed-laboratory and are supported by the equipment and personnel based at **TARGET**'s corporate headquarters.

5.0 Health and Safety Procedures

TARGET recognizes the importance of Health & Safety at each project site. For each project, **TARGET**'s Corporate Health & Safety Officer reviews all materials provided by the client and then either accepts the client's Site Safety Plan or prepares a more stringent addendum to that plan specific to **TARGET**'s field activities for the site. All **TARGET** field personnel have successfully completed a 40-hour Health and Safety training course, fulfilling the initial training requirements as specified in OSHA's interim regulation for hazardous waste operations [OSHA 29 CFR 1910.120 (e) and SARA 126]. Annual 8-hour updates and Supervisory Courses have been completed as appropriate. **TARGET** owns and maintains all equipment necessary for operations under Levels C and B, including protective suits, respirators, and SCBA's

6.0 Field Sampling Procedures

Upon arrival at the site, **TARGET**'s 2-man team will check the site map for accuracy, measure out the sampling grid, and mark each location with a pin flag or paint. An electric hammer-drill will be used to penetrate pavement or compact soil, where necessary. **TARGET** personnel will repair such holes upon completion of sampling.

6.1 Sample Collection Procedures

Water or soil samples are to be collected at pre-determined locations with on-site additions or deletions as directed by the client and actual conditions. The actual sampling depth will depend on local conditions (i.e. depth to ground water or bedrock) and field observations.

To collect **ground water samples**, **TARGET**'s hydraulic probe will be used to drive 1.25" diameter steel pipe to the prescribed depth (conditions permitting) at each location. The bottom of the pipe will be opened or the pipe will be replaced with a slotted PVC pipe to allow water to enter from the soil. **TARGET** personnel will gauge the actual depth to ground water in the initial hole. Samples of ground water will be collected with a teflon sampling tube or a stainless steel mini-bailer lowered through the steel pipe. Each water sample will be stored in a 40ml EPA-clean amber glass VOA vial. Samples will be pH adjusted to inhibit microbial breakdown of contaminants and refrigerated, pending analysis.

Soil samples will be collected by hydraulically driving a 1.25" diameter piston-type sampler to the top of the desired sample interval (conditions permitting). The piston within the sampler will then be released and the pipe will be advanced through the target interval. The soil core will enter the sampler, which contains a new non-reactive plastic or stainless steel liner. After the drive rod is removed from the soil, the liner containing the soil column can be removed. The liner may be capped at the ends or the soil may be extruded into 40 ml glass vials and sealed with teflon-lined caps. If a plastic liner is used, it may be opened longitudinally to expose the soil, and a specific section of the sample can be chosen for analysis. The samples will be refrigerated, pending analysis.

6.2 Field Decontamination Procedures

The following procedures have been established by **TARGET** to protect sample integrity and limit cross-contamination from one sample to another. The sampling probes and apparatus are decontaminated internally and externally prior to each day's sample collection, and at additional intervals as judged appropriate by the sampling team.

Prior to each day's work, the sampling equipment is washed with a non-phosphate cleaner/distilled water solution, and wiped dry with clean paper towels. The equipment is rinsed with distilled water and then wiped dry with clean paper towels. Prior to each sample collection, the lower sections of pipe and the sampling apparatus are wiped clean. Additional Decontamination will be done when field observations (such as odors, stains, or client information) indicate that a specific sample may be highly contaminated.

6.3 Field Control Samples

Equipment Rinseate Blanks are collected by running distilled water through the sampling apparatus at the beginning and end of each day.

6.4 Field Documentation Procedures

A field book will be used to document actual field conditions and procedures. General site information and changes to standard operating procedures are noted as well as specific information about each sample point. Field documentation at each sample location includes:

- sample identification
- general area observations
- general remarks
- depth to sample
- equipment used (i.e. manual or probe)
- general description of the sample location

Although this information is not usually reported, it is used when preparing the project report to ensure accurate interpretation of the sample data.

6.5 Sample Custody

Samples are logged on a Chain of Custody form which accompanies the samples during custody transfers, or transport to the analytical laboratory.

At the end of each sampling day, samples are recounted and chain-of-custody forms are completed for all samples All information on the chain-of-custody form and the sample labels is checked against the field log book entries before leaving the site.

The field personnel are responsible for the care and custody of the collected samples until properly dispatched to the receiving laboratory or turned over to an assigned custodian or overnight carrier. Upon transfer of custody, the chain-of-custody form is signed by a member of the sampling team.

If the samples are analyzed in **TARGET**s on-site laboratory, after the analysis the samples will be delivered to **TARGET**s corporate laboratory in Columbia, Maryland. Overnight carriers (i.e Federal Express, UPS, etc.) do not sign chain-of-custody forms; therefore, the chain-of-custody records will be sealed within each container of samples. The receipt or airbill for the shipment will be retained in the project file as part of the chain-of-custody documentation.

All chain-of-custody forms received by the laboratory are signed and dated by the laboratory sample custodian and returned to the project file.

7.0 Analytical Procedures

7.1 Calibration

Both FID and ECD analyses are conducted at Range 1. Three-point least squares linear regression calibration curves are generated for each detector as needed and the correlation coefficients are examined for each standardized analyte. Correlation coefficients must be greater than 0.99. The calibration curve is then used to quantify the concentration of analytes in samples. Following the initial three-point calibration, check standards are analyzed at the beginning and end of each day to ensure retention time and response stability. Windows for retention times will be set using the narrowest time band possible (usually 0.05 - 0.1 minutes) without including non-standardized peaks.

7.2 Modified EPA Methods 8010 and 8020

A gas chromatograph equipped with an electron capture detector (GC/ECD), following modified EPA 8010 methodology, is used to identify and quantify chlorinated compounds typically found in industrial solvents, while a flame ionization detector (GC/FID), following a modified EPA 8020 methodology, is used for petroleum and other non-halogenated compounds. EPA method 3810 will be used to prepare the water and soil samples for analysis

The water or soil sample is placed in a 40mL EPA approved screw cap glass vial with a teflon-faced septum and is stored at less than or equal to 4°C until analysis. An aliquot of 15mL of water or 5g of soil is placed into a 30mL EPA clean vial and then capped with a self-sealing septum. The vial is heated in a 90°C block for 10 minutes, in order for an equilibrium to be established between the soil or water sample and the headspace above it. The autosampler gas-tight syringe pierces the septum of the vial and a portion of the headspace is removed and immediately injected into the GC for analysis. Standards are prepared in the same manner as the samples. Methanolic stock solutions purchased from AccuStandard (New Haven, CT) are used to prepare standards.

7.3 Reported Quantification Limits

The "Reported Quantification Limit" is a concentration level at which the degree of confidence in the actual presence of a compound becomes meaningful. A reported quantification limit should not be confused with the concentration represented by the smallest detectable chromatogram peak area. The importance of reported quantification limits should also be weighed in the context of acceptable exposure levels and the general levels of contamination on a site The reported quantification levels for compounds to be identified on the GC/ECD/FID will be 1.0 µg/L for using vapor standards. The following tables list the minimum concentrations (the reported quantification limits) of selected compounds reported using TARGET's analyses (additional analytes are available).

Volatile Organic Compounds	Reported Quantification Limits (ug/L)
benzene	1.0
ethylbenzene	1.0
toluene	1.0
total xylenes (ortho, meta, para- isomers)	1.0
1,1-dichloroethene (1,1-DCE)	1.0
c-1,2-DCE	1.0
t-1,2-DCE	1.0
dichloroethane (1,1-DCA)	1.0
methylene chloride	1.0
trichloroethene (TCE)	1.0
1,1,1-trichloroethane (1,1,1-TCA)	1.0
1,1,2-TCA	1.0
carbon tetrachloride	1.0
tetrachloroethene (PCE)	1.0

8.0 Data Reduction, Validation, and Reporting

The data is reviewed to ensure proper identification and quantitation of standardized analytes, to ensure that daily check standards results are within 20% of the second level standard, to ensure that sample replicate analysis results are within 20% of each other, and to ensure that matrix spike percent recovery results are within 50 to 150%.

The data and chromatograms are then submitted to the Interpretation and Reporting Group, where each chromatogram is reviewed to confirm the identification and quantification of each standardized analyte. The Total FID Volatiles are calculated and data tables are prepared.

9.0 Audits

The performance audit consists of laboratory blanks (every 10 samples), replicate analysis of every tenth sample, check standards (at the end of every job or after 40 samples), and equipment rinseates (at the beginning and end of each day). The data quality objective with respect to QC blanks is to achieve analytical concentrations below the quantification limit for all analytes.

Data from the analysis of standards and quality control samples (replicates, laboratory blanks, rinseate blanks, and check standards) are reviewed by the in-field GC analyst, a QA assistant and the Project Scientist prior to the preparation of the final project report. When contamination is determined to be present in a lab or field blank, an assessment as to the effect of the contamination on the validity of the data from any field sample locations will be made.

10.0 Preventive Maintenance

Maintenance checks are conducted on a daily basis and all information is recorded in the system maintenance book. Daily checks include:

- monitoring purge and flow rates
- checking gas pressure readings to the GC
- checking the syringe body alignment
- replacement of the injection septa
- ensuring a lit flame for the FID
- conditioning the columns at 200°C
- checking the injection ports
- checking the sufficient pressure warning light on the autosampler

The carrier gases are checked twice daily, on arrival in the morning and on departure in the evening. They are replaced when necessary or if there is a problem with the analysis on the GCs. Other maintenance checks include: 1) teflon plunger tips on the syringes are replaced at least once a month; 2) the carousel wheel and its mechanisms are adjusted when necessary; 3) columns are replaced as required based on loss of resolving capability or decrease in retention times (all other parameters constant) of more than five minutes; 4) All tubing is replaced when necessary.